The
RICHARDSON
Manual

WE take great pleasure in offering the "Richardson" Manual to Heating Contractors, Plumbers, Range Merchants, Architects and Builders, believing that our literature in this form will be most useful.

The complete line of Richardson "Perfect" heating and cooking apparatus, with detailed information and engineering data is herein.

Sections are as follows and in this order:

We believe you will find it convenient to keep this literature up-to-date, because it will be possible for us to send you newer information more promptly.

We sincerely hope this Manual will meet your daily requirements fully, and in the most satisfactory manner.

RICHARDSON & BOYNTON CO.

June, 1925

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RICHARDSON BOILERS

FOR STEAM AND HOT WATER HEATING

Richardson & Boynton Co.

Manufacturers of

"Richardson" "Perfect"

Heating and Cooking Apparatus

Since 1837

Executive Offices: New York: 260 Fifth Avenue

Boston: 60 High Street
Philadelphia: 1308 Arch Street
Buffalo: 220 Delaware Avenue
Newark: 585 So. 21st Street
Chicago: 3641 So. Ashland Ave.
Minneapolis, Minn.: 100 N. 7th St.
Providence: 58 Exchange Street
Rochester: 70 Exchange Street
Detroit: 4472 Cass Street
Pittsburgh: 605 House Bldg.
St. Louis: 705 Olive Street
Cleveland, O.: 2032 E. 22nd St.
Springfield, Mass.: 194 Chestnut Street

Methods of Manufacturing

HAVING been manufacturers of cast-iron house heating apparatus for many years, we have naturally benefited by our long experience, until Richardson Boilers have now reached the highest point of perfection.

We have found there is no economy or satisfaction to be derived from the use of poor material; consequently, we confine our purchases to the highest grades of iron and coke which are obtainable, and the iron accepted by our foundry must show the proper chemical analysis for the kind of castings it is called upon to furnish.

Every attention is paid to proper temperatures when pouring iron for boiler sections, in order that each section when finished will stand the high hydrostatic pressure to which we test it. Each section is tested under a heavy pressure of water, carefully reamed and machined, and the sections assembled and set up in the various sizes of boilers. When they are carefully set up they are subject to still another hydrostatic test, to insure all joints and connections being tight and perfect in every way. This is a practice which is very exceptional.

The boiler sections are connected one to the other by machine-cut tapered *cast-iron* nipples, of the same kind of metal as the section. The use of any other material has been demonstrated a complete failure. The use of the same material in the boiler sections and nipples insures the user against unevenness in either contraction or expansion, with the ultimate possibilities and probabilities of cracks and leaks.

Round Sectional Steam and Water Boilers

Can Be Furnished with Grates for Pea Coal

The "*Richardson*" Round Boiler was designed to be powerful, yet economical. They have large feed doors and ample clean-out and ash-pit doors.

All boilers have cored openings in firepot for coil; and steam boilers have tapping in dome section, right side, for indirect water heater. Steam Boilers can be fitted with fusible plugs.

19 Series Round Sectional

Steam

No.	Height to Top Outlet Inches	Nom. Diam. Grate Ins.	Grate Area Sq. Ft.	Height Water Line Inches	Outlets No. and Size	Inlets No. and Size	8 Hour Ratg. Sq. Ft.
190	47½	19	1.97	42½	2–2½	2–2½	300
191	51½	19	1.97	46½	2–2½	2–2½	350
192	55½	19	1.97	50½	2–2½	2–2½	375

Water

190	45¼	19	1.97	....	2–2½	2–2½	500
191	49¼	19	1.97	....	2–2½	2–2½	575
192	53¼	19	1.97	....	2–2½	2–2½	625

Size of smoke-pipe 19 in. Series, 8 in. For other measurements see page 54.

Factors determining Boiler Capacities

(Derived from Actual Tests)

No. of Boiler—Steam and Water	190	191	192
A—Fuel available, hard coal........lbs.	98	98	98
B—Rekindling reserve........lbs.	25	25	25
C—Adequate fuel charge (A+B)........lbs.	123	123	123
D—Steam produced per pound coal (evaporative power)........lbs.	7.5	8.0	8.5
E—Total Steam (AxD) (Heating power)........lbs.	735	784	833
F—Area of square cornered chimney flue........sq. in.	64	64	64
G—Height of chimney flue........ft.	35	35	35

See tables regarding chimney flues. Page 37-BM.

Method for establishing Ratings

When load attached to boiler consists of direct radiation installed in a residence for 70 degrees, the heat-condensing power of the radiation and piping combined, rarely exceeds 0.25 (¼) pounds of steam per square foot per hour. The capacity of the "*Richardson*" Boilers as indicated in the following table is figured on this basis.

If load attached to boiler has a condensing power exceeding 0.25, such as occurs in factories and other buildings heated to a low temperature, or in which is used radiating surface having a greater condensing power, the factor representing the increased condensation, should be used.

To convert line E to B.t.u., multiply by 970. When the hourly heat energy is expressed in terms of B.t.u., divide same by 250 for steam, or 150 for water.

If A is burned in 8 hours, divide E by 8 x 0.25 to obtain the capacity at that rate. If A is burned in 6 hours, divide E by 6 x 0.25 for that capacity.

No. of Boiler		190	191	192
When A is burned in 6 hours........	Steam	490	523	555
Equivalent capacity........	Water	817	873	925
When A is burned in 8 hours........	Steam	**368**	**392**	**417**
Equivalent capacity........	Water	**613**	**653**	**694**
When A is burned in 10 hours........	Steam	294	314	333
Equivalent capacity........	Water	490	523	555
When A is burned in 12 hours........	Steam	245	261	278
Equivalent capacity........	Water	408	435	463

See Page 51.

Round Sectional Steam and Water Boilers

Can Be Furnished with Grates for Pea Coal

Each "*Richardson*" Boiler has a deep fire chamber with corrugated sides and over the fire a large amount of active heating surface, properly proportioned for the rating of the boiler.

All boilers have cored openings in firepot for coil; and steam boilers have tapping in dome section, right side, for indirect water heater. Steam Boilers can be fitted with fusible plugs.

22 and 25 Series Round Sectional

No.	Height to Top Outlet Inches	Nom. Diam. Grate Ins.	Grate Area Sq. Ft.	Height Water Line Inches	Outlets No. and Size	Inlets No. and Size	8 Hour Ratg. Sq. Ft.
Steam							
221	53	22	2.64	48¼	2–2½	2–2½	450
222	57	22	2.64	52¼	2–2½	2–2½	500
223	61	22	2.64	56¼	2–2½	2–2½	550
251	54¼	25	3.41	49½	2–3	2–3	625
252	58¼	25	3.41	53½	2–3	2–3	675
253	62¼	25	3.41	57¼	2–3	2–3	725
Water							
221	50½	22	2.64	....	2–2½	2–2½	750
222	54½	22	2.64	....	2–2½	2–2½	825
223	58½	22	2.64	....	2–2½	2–2½	900
251	52	25	3.41	....	2–3	2–3	1025
252	56	25	3.41	....	2–3	2–3	1100
253	60	25	3.41	....	2–3	2–3	1200

Size of smoke-pipe 22 in. Series, 9 in.; 25 in. Series, 10 in. For other measurements see page 54.

Factors determining Boiler Capacities
(Derived from Actual Tests)

No. of Boiler—Steam and Water	221	222	223	251	252	253
A—Fuel available, hard coal........lbs.	137	137	137	177	177	177
B—Rekindling reserve.............lbs.	34	34	34	44	44	44
C—Adequate fuel charge (A+B)....lbs.	171	171	171	221	221	221
D—Steam produced per pound coal (evaporative power).......lbs.	8.0	8.5	9.0	8.0	8.5	9.0
E—Total Steam (AxD) (Heating power)..................lbs.	1095	1165	1233	1415	1505	1594
F—Area of square cornered chimney flue...................sq. in.	96	96	96	96	96	96
G—Height of chimney flue..........ft.	35	35	35	40	40	40

See tables regarding chimney flues. Page 37-BM.

Method for establishing Ratings

When load attached to boiler consists of direct radiation installed in a residence for 70 degrees, the heat-condensing power of the radiation and piping combined, rarely exceeds 0.25 (¼) pounds of steam per square foot per hour. The capacity of the "*Richardson*" Boilers as indicated in the following table is figured on this basis.

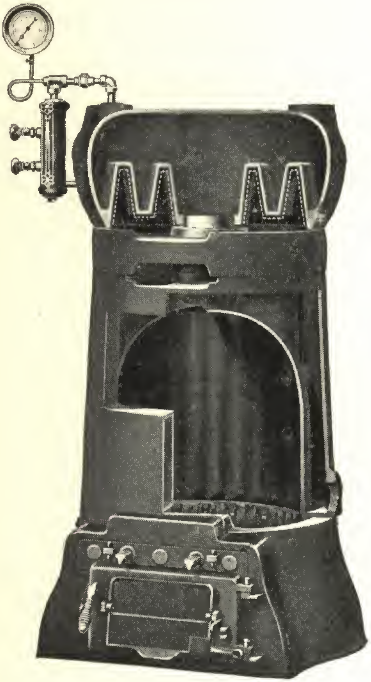
If load attached to boiler has a condensing power exceeding 0.25, such as occurs in factories and other buildings heated to a low temperature, or in which is used radiating surface having a greater condensing power, the factor representing the increased condensation, should be used.

To convert line E to B.t.u., multiply by 970. When the hourly heat energy is expressed in terms of B.t.u., divide same by 250 for steam, or 150 for water. If A is burned in 8 hours, divide E by 8 x 0.25 to obtain the capacity at that rate. If A is burned in 6 hours, divide E by 6 x 0.25 for that capacity.

No. of Boiler		221	222	223	251	252	253
When A is burned in 6 hours.....	Steam	730	777	823	943	1003	1063
Equivalent capacity.......	Water	1216	1295	1374	1572	1670	1770
When A is burned in 8 hours.....	Steam	**548**	**583**	**617**	**708**	**753**	**797**
Equivalent capacity.......	Water	**914**	**973**	**1026**	**1180**	**1255**	**1326**
When A is burned in 10 hours....	Steam	438	466	493	566	602	638
Equivalent capacity.......	Water	731	777	823	943	1003	1064
When A is burned in 12 hours....	Steam	365	388	411	472	502	531
Equivalent capacity.......	Water	608	647	685	786	836	885

See Page 51.

Round Sectional Steam and Water Boilers



Can Be Furnished with Grates for Pea Coal

Interior view of the "*Richardson*" Round Boiler, showing corrugated inside surface of firepot, high combustion chamber and deep fire to permit of a low rate of combustion. The dome section adds greatly to the efficiency on account of the large surfaces in contact with the heated gases.

All boilers have cored openings in firepot for coil and steam boilers have tapping in dome section, right side, for indirect water heater. Steam Boilers can be fitted with fusible plugs.

28 Series Round Sectional

Steam

No.	Height to Top Outlet Ins.	Nom. Diam. Grate Ins.	Grate Area Sq. Ft.	Height Water Line Ins.	Outlets No. and Size	Inlets No. and Size	8 Hour Ratg. Sq. Ft.
281	55¾	28	4.28	51	2–3½	2–3½	875
282	59¾	28	4.28	55	2–3½	2–3½	950
283	63¾	28	4.28	59	2–3½	2–3½	1025

Water

No.	Height to Top Outlet Ins.	Nom. Diam. Grate Ins.	Grate Area Sq. Ft.	Height Water Line Ins.	Outlets No. and Size	Inlets No. and Size	8 Hour Ratg. Sq. Ft.
281	53¼	28	4.28	....	2–3½	2–3½	1350
282	57¼	28	4.28	....	2–3½	2–3½	1550
283	61¼	28	4.28	....	2–3½	2–3½	1675

Size of smoke-pipe 10 in. For other measurements see page 54.

Factors determining Boiler Capacities

(Derived from Actual Tests)

No. of Boiler—Steam and Water	281	282	283
A—Fuel available, hard coal....................lbs.	273	273	273
B—Rekindling reserve..........................lbs.	68	68	68
C—Adequate fuel charge (A+B)..................lbs.	341	341	341
D—Steam produced per pound coal (evaporative power) lbs.	8.0	8.5	9.0
E—Total Steam (AxD) (Heating power)............lbs.	2184	2320	2457
F—Area of square cornered chimney flue.........sq. in.	144	144	144
G—Height of chimney flue.......................ft.	50	50	50

See tables regarding chimney flues. Page 37-BM.

Method for establishing Ratings

When load attached to boiler consists of direct radiation installed in a residence for 70 degrees, the heat-condensing power of the radiation and piping combined, rarely exceeds 0.25 (¼) pounds of steam per square foot per hour.

The capacity of the "*Richardson*" Boilers as indicated in the following table, is figured on this basis.

If load attached to boiler has a condensing power exceeding 0.25, such as occurs in factories and other buildings heated to a low temperature, or in which is used radiating surface having a greater condensing power, the factor representing the increased condensation, should be used.

To convert line E to B.t.u., multiply by 970. When the hourly heat energy is expressed in terms of B.t.u., divide same by 250 for steam, or 150 for water.

If A is burned in 8 hours, divide E by 8 x 0.25 to obtain the capacity at that rate. If A is burned in 6 hours, divide E by 6 x 0.25 for that capacity.

No. of Boiler	.....	281	282	283
When A is burned in 6 hours....................	Steam	1455	1547	1673
Equivalent capacity.....................	Water	2425	2578	2808
When A is burned in 8 hours....................	Steam	1092	1160	1229
Equivalent capacity.....................	Water	1820	1933	2050
When A is burned in 10 hours...................	Steam	874	928	983
Equivalent capacity.....................	Water	1457	1547	1638
When A is burned in 12 hours...................	Steam	728	773	819
Equivalent capacity.....................	Water	1213	1288	1365

See Page 51.

Round Sectional Steam and Water Boilers

Can Be Furnished with Grates for Pea Coal

The practical boiler for residences and small buildings, powerful and economical. The deep fire chamber will carry fire and generate heat for a long time without attention. The feed and ash-pit doors are large and convenient.

All boilers have cored openings in firepot for coil; and steam boilers have tapping in dome section, right side, for indirect water heater. Steam Boilers can be fitted with fusible plugs.

17, 20 and 23 Series Round Sectional

Steam

No.	Height to Top Outlet Inches	Nom. Diam. Grate Ins.	Grate Area Sq. Ft.	Height Water Line Inches	Outlets No. and Size	Inlets No. and Size	8 Hour Ratg. Sq. Ft.
417S	49½	17	1.58	46¼	1–2½	2–2½	275
517S	53¾	17	1.58	48½	1–2½	2–2½	300
420S	50½	20	2.18	45¼	1–3	2–3	375
520S	54¾	20	2.18	49½	1–3	2–3	425
423S	53½	23	2.89	48¼	1–3	2–3	475
523S	57¾	23	2.89	52½	1–3	2–3	525

Water

No.	Height to Top Outlet Inches	Nom. Diam. Grate Ins.	Grate Area Sq. Ft.	Height Water Line Inches	Outlets No. and Size	Inlets No. and Size	8 Hour Ratg. Sq. Ft.
417W	42¾	17	1.58	....	2–2½	2–2½	425
517W	47	17	1.58	....	2–2½	2–2½	475
420W	43¾	20	2.18	....	2–3	2–3	625
520W	48	20	2.18	....	2–3	2–3	700
423W	45¾	23	2.89	....	2–3	2–3	775
523W	50	23	2.89	....	2–3	2–3	850

Size of smoke-pipe 17 in. Series, 7 in.; 20 in. Series, 8 in.; 23 in. Series, 9 in. For other measurements see page 57.

Factors determining Boiler Capacities

(Derived from Actual Tests)

No. of Boiler—Steam and Water	417	517	420	520	423	523
A—Fuel available, hard coal............lbs.	75	75	107	107	132	132
B—Rekindling reserve.................lbs.	19	19	27	27	33	33
C—Adequate fuel charge (A+B)........lbs.	94	94	134	134	165	165
D—Steam produced per lb. coal (evaporative power)........................lbs.	7.5	8.0	7.5	8.0	7.5	8.0
E—Total Steam (AxD) (Htg. power)....lbs.	563	600	803	856	1238	1320
F—Area of sq. cornered chimney flue..sq. in.	64	64	64	64	96	96
G—Height of chimney flue..............ft.	30	30	35	35	35	35

See tables regarding chimney flues. Page 37-BM.

Method for establishing Ratings

When load attached to boiler consists of direct radiation installed in a residence for 70 degrees, the heat-condensing power of the radiation and piping combined, rarely exceeds 0.25 (¼) lbs. of steam per sq. ft. per hour. The capacity of the "*Richardson*" Boilers as indicated in the following table is figured on this basis.

If load attached to boiler has a condensing power exceeding 0.25, such as occurs in factories and other buildings heated to a low temperature, or in which is used radiating surface having a greater condensing power, the factor representing the increased condensation, should be used.

To convert line E to B.t.u., multiply by 970. When the hourly heat energy is expressed in terms of B.t.u., divide same by 250 for steam, or 150 for water.

If A is burned in 8 hours, divide E by 8 x 0.25 to obtain the capacity at that rate. If A is burned in 6 hours, divide E by 6 x 0.25 for that capacity.

No. of Boiler	417	517	420	520	423	523
When A is burned in 6 hours.....Steam	367	400	500	567	633	700
Equivalent capacity.......Water	567	633	833	933	1033	1133
When A is burned in 8 hours.....Steam	275	300	375	425	475	525
Equivalent capacity.......Water	425	475	625	700	775	850
When A is burned in 10 hours....Steam	220	240	300	340	380	420
Equivalent capacity.......Water	340	380	500	560	620	680
When A is burned in 12 hours....Steam	183	200	250	283	317	350
Equivalent capacity.......Water	283	317	417	467	517	567

See Page 51.

Round Sectional Steam and Water Boilers

Can Be Furnished with Grates for Pea Coal

The firepot section permits carrying a fire 20 inches deep, thus insuring economical consumption of fuel and also sufficient capacity to permit 8- or 12-hour firing periods. Over the fire is a large amount of active heating surface, properly proportioned to utilize the full heat from the fire.

All boilers have cored openings in firepot for coil; and steam boilers have tapping in dome section, right side, for indirect water heater. Steam Boilers can be fitted with fusible plugs.

26 and 29 Series Round Sectional

Steam

No.	Height to Top Outlet Inches	Nom. Diam. Grate Ins.	Grate Area Sq. Ft.	Height Water Line Inches	Outlets No. and Size	Inlets No. and Size	8 Hour Ratg. Sq. Ft.
426S	55½	26	3.70	49½	1–3½	2–3½	675
526S	59¾	26	3.70	53¾	1–3½	2–3½	750
1429S	60	29	4.59	53½	2–3½	2–3½	950
1529S	65⅜	29	4.59	58⅞	2–3½	2–3½	1050
1629S	70¾	29	4.59	64¼	2–3½	2–3½	1150
			Water				
426W	47⅛	26	3.70	....	2–3½	2–3½	1100
526W	51⅜	26	3.70	....	2–3½	2–3½	1225
1429W	50½	29	4.59	....	2–3½	2–3½	1550
1529W	55⅞	29	4.59	....	2–3½	2–3½	1700
1629W	61¼	29	4.59	....	2–3½	2–3½	1850

NOTE—Steam boilers Nos. 1429, 1529 and 1629 have two steam tappings in center; one on each side, instead of one front center tapping as on steam boilers Nos. 417 to 526. Distance between steam tappings on 29 Series boilers 30½ inches center to center.

Size of smoke-pipe 26 in. Series and 29 in. Series, 10 in. For other measurements see Page 57.

Factors determining Boiler Capacities
(Derived from Actual Tests)

No. of Boiler—Steam and Water	426	526	1429	1529	1629
A—Fuel available, hard coal..............lbs.	188	188	290	290	290
B—Rekindling reserve..................lbs.	47	47	72	72	72
C—Adequate fuel charge (A+B).........lbs.	235	235	362	362	362
D—Steam produced per pound coal (evaporative power)....................lbs.	7.5	8.0	7.5	8.0	8.5
E—Total Steam (AxD) (Heating power)....lbs.	1763	1880	2175	2320	2465
F—Area of square cornered chimney flue, sq. in.	96	96	144	144	144
G—Height of chimney flue.................ft.	40	40	50	50	50

See tables regarding chimney flues. Page 37-BM.

Method for establishing Ratings

When load attached to boiler consists of direct radiation installed in a residence for 70 degrees, the heat-condensing power of the radiation and piping combined, rarely exceeds 0.25 (¼) pounds of steam per square foot per hour. The capacity of the "*Richardson*" Boilers as indicated in the following table is figured on this basis.

If load attached to boiler has a condensing power exceeding 0.25, such as occurs in factories and other buildings heated to a low temperature, or in which is used radiating surface having a greater condensing power, the factor representing the increased condensation, should be used.

To convert line E to B.t.u., multiply by 970. When the hourly heat energy is expressed in terms of B.t.u., divide same by 250 for steam, or 150 for water.

If A is burned in 8 hours, divide E by 8 x 0.25 to obtain the capacity at that rate. If A is burned in 6 hours, divide E by 6 x 0.25 for that capacity.

No. of Boiler	426	526	1429	1529	1629
When A is burned in 6 hours..........Steam	900	1000	1450	1546	1640
Equivalent capacity............Water	1467	1633	2320	2473	2624
When A is burned in 8 hours..........Steam	675	750	1087	1160	1230
Equivalent capacity............Water	1100	1225	1739	1856	1968
When A is burned in 10 hours.........Steam	540	600	870	928	986
Equivalent capacity............Water	880	980	1392	1485	1577
When A is burned in 12 hours.........Steam	450	500	725	740	822
Equivalent capacity............Water	733	817	1160	1184	1315

See Page 51.

Western Series
Round Sectional Steam and Water Boilers

"*Richardson*"
Steam Boiler

All Western Series Steam Boilers fitted with fusible plugs

"*Richardson*"
Water Boiler

Western Series 17 and 20 Inch Round Boilers

Steam

No.	Height to Top Outlet Ins.	Nom. Diam. Grate Ins.	Height Water Line Ins.	Outlets No. and Size	Inlets No. and Size	8 Hour Rating Sq. Ft.
173	45¼	17	40	1–2½	2–2½	275
174	49½	17	44¼	1–2½	2–2½	325
175	53¾	17	48½	1–2½	2–2½	350
203	46¼	20	41	1–3	2–3	425
204	50½	20	45¼	1–3	2–3	475
205	54¾	20	49½	1–3	2–3	500
Water						
174	42¾	17	....	2–2½	2–2½	525
175	47	17	....	2–2½	2–2½	575
204	43¾	20	....	2–3	2–3	775
205	48	20	....	2–3	2–3	825

Size of smoke-pipe 17 in. Series, 7 in.; 20 in. Series, 8 in. For other measurements see Page 60.

Factors determining Boiler Capacities

No. of Boiler—Steam and Water....	173	174	175	203	204	205
A—Fuel available, hard coal....lbs.	88	88	88	125	125	125
B—Rekindling reserve.........lbs.	22	22	22	31	31	31
C—Adequate fuel charge (A+B) lbs.	110	110	110	156	156	156
D—Steam produced per pound coal (evaporative power) lbs.	7	7.5	8	7	7.5	8
E—Total steam (AxD)(Htg. power) lbs.	616	660	704	875	938	1000
F—Area of square cornered chimney flue................sq. in.	64	64	64	64	64	64
G—Height of chimney flue......ft.	30	30	30	35	35	35

See tables regarding chimney flues. Page 37-BM.

Method for establishing Ratings

When load attached to boiler consists of direct radiation installed in a residence for 70 degrees, the condensing power of the radiation and piping combined, rarely exceeds 0.25 (¼) pounds of steam per square foot per hour. The capacity of the "*Richardson*" Boilers as indicated in the following table is figured on this basis.

If load attached to boiler has a condensing power exceeding 0.25, such as occurs in factories and other buildings heated to a low temperature, or in which is used radiating surface having a greater condensing power, the factor representing the increased condensation should be used.

To convert line E to B.t.u. multiply by 970. When the hourly heat energy is expressed in terms of B.t.u. divide same by 250 for steam, or 150 for water.

If A is burned in 8 hours, divide E by 8x0.25 to obtain the capacity at that rate. If A is burned in 6 hours, divide E by 6x0.25 for that capacity.

No. of Boiler—Steam and Water...	173	174	175	203	204	205
When A is burned in 6 hours..Steam	411	440	469	585	625	667
Equivalent capacity...Water	...	733	782	...	1042	1111
When A is burned in 8 hours..Steam	308	330	352	438	469	500
Equivalent capacity...Water	...	550	587	...	782	833
When A is burned in 10 hours Steam	247	264	282	351	375	400
Equivalent capacity...Water	...	440	470	...	625	667
When A is burned in 12 hours Steam	206	220	235	293	313	333
Equivalent capacity...Water	...	367	392	...	522	555

See Page 51.

Western Series
Round Sectional Steam and Water Boilers

"*Richardson*"
Steam Boiler

All Western Series Steam Boilers fitted with fusible plugs

"*Richardson*"
Water Boiler

Western Series 23 and 26 Inch Round Boilers

Steam

No.	Height to Top Outlet Ins.	Nom. Diam. Grate Ins.	Height Water Line Ins.	Outlets No. and Size	Inlets No. and Size	8 Hour Rating Sq. Ft.
233	49¼	23	44	1–3	2–3	575
234	53½	23	48¼	1–3	2–3	625
235	57¾	23	52½	1–3	2–3	675
263	51¼	26	45¼	1–3½	2–3½	750
264	55½	26	49½	1–3½	2–3½	825
265	59¾	26	53¾	1–3½	2–3½	900
Water						
234	45¾	23	....	2–3	2–3	1025
235	50	23	....	2–3	2–3	1100
264	47⅛	26	....	2–3½	2–3½	1375
265	51⅜	26	....	2–3½	2–3½	1500

Size of smoke-pipe 23 in. Series, 9 in.; 26 in. Series, 10 in. For other measurements see Page 60.

Factors determining Boiler Capacities

No. of Boiler—Steam and Water	233	234	235	263	264	265
A—Fuel available, hard coal lbs.	169	169	169	225	225	225
B—Rekindling reserve....lbs.	42	42	42	56	56	56
C—Adequate fuel charge (A+B).............lbs.	211	211	211	281	281	281
D—Steam produced per pound coal (evap. power)..lbs.	7	7.5	8	7	7.5	8
E—Total steam (AxD) (Htg. power)...........lbs.	1183	1268	1352	1575	1688	1800
F—Area of square cornered chimney flue....sq. in.	96	96	96	96	96	96
G—Height of chimney flue . ft.	35	35	35	40	40	40

See tables regarding chimney flues. Page 37-BM.

Method for establishing Ratings

When load attached to boiler consists of direct radiation installed in a residence for 70 degrees, the condensing power of the radiation and piping combined, rarely exceeds 0.25 (¼) pounds of steam per square foot per hour. The capacity of the "*Richardson*" Boilers as indicated in the following table is figured on this basis.

If load attached to boiler has a condensing power exceeding 0.25, such as occurs in factories and other buildings heated to a low temperature, or in which is used radiating surface having a greater condensing power, the factor representing the increased condensation should be used.

To convert line E to B.t.u., multiply by 970. When the hourly heat energy is expressed in terms of B.t.u., divide same by 250 for steam, or 150 for water.

If A is burned in 8 hours, divide E by 8x0.25 to obtain the capacity at that rate. If A is burned in 6 hours, divide E by 6x0.25 for that capacity.

No. of Boiler	233	234	235	263	264	265
When A is burned in 6 hrs..Steam	789	845	901	1051	1126	1200
Equivalent capacity....Water	...	1409	1501	....	1878	2000
When A is burned in 8 hrs..Steam	592	634	676	788	844	900
Equivalent capacity....Water	...	1057	1127	....	1407	1500
When A is burned in 10 hrs..Steam	473	507	540	630	675	720
Equivalent capacity....Water	...	845	900	....	1125	1200
When A is burned in 12 hrs..Steam	394	423	451	526	563	600
Equivalent capacity....Water	...	706	751	....	939	1000

See Page 51.

Western Series
Round Sectional Steam and Water Boilers

"*Richardson*"
Steam Boiler

All Western Series Steam Boilers fitted with fusible plugs

"*Richardson*"
Water Boiler

Western Series 29 Inch Round Boilers

Steam

No.	Height to Top Outlet Ins.	Nom. Diam. Grate Ins.	Height Water Line Ins.	Outlets No. and Size	Inlets No. and Size	8 Hour Rating Sq. Ft.
294	59⅜	29	53½	2–3½	2–3½	1100
295	64⅝	29	58¾	2–3½	2–3½	1200
296	69⅞	29	64	2–3½	2–3½	1300
			Water			
294	50⅝	29	....	2–3½	2–3½	1750
295	55⅞	29	....	2–3½	2–3½	1900
296	61	29	....	2–3½	2–3½	2050

NOTE—Steam boilers Nos. 293, 294, 295 and 296 have two tappings in center on each side, instead of one front center tapping as on steam boilers Nos. 173 to 265. Distance between steam tappings on 29 Series boilers 30½ inches center to center.

Size of smoke-pipe 10 inches. For other measurements see Page 60.

Factors determining Boiler Capacities

No. of Boiler—Steam and Water	294	295	296
A—Fuel available, hard coal..................lbs.	310	310	310
B—Rekindling reserve......................lbs.	72	72	72
C—Adequate fuel charge (A+B)..............lbs.	382	382	382
D—Steam produced per pound coal (evaporative power)...........................lbs.	8.0	8.5	9.0
E—Total Steam (AxD) (Htg. power)...........lbs.	3216	3417	3618
F—Area of square cornered chimney flue.....sq. in.	144	144	144
G—Height of chimney flue...................ft.	50	50	50

See tables regarding chimney flues. Page 37-BM.

Method for establishing Ratings

When load attached to boiler consists of direct radiation installed in a residence for 70 degrees, the heat-condensing power of the radiation and piping combined, rarely exceeds 0.25 (¼) pounds of steam per square foot per hour.

The capacity of the "*Richardson*" Boilers as indicated in the following table, is figured on this basis.

If load attached to boiler has a condensing power exceeding 0.25, such as occurs in factories and other buildings heated to a low temperature, or in which is used radiating surface having a greater condensing power, the factor representing the increased condensation should be used.

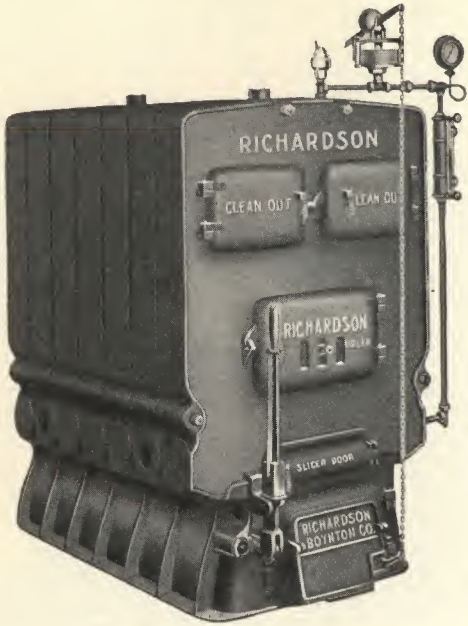
To convert line E to B.t.u., multiply by 970. When the hourly heat energy is expressed in terms of B.t.u., divide same by 250 for steam, or 150 for water.

If A is burned in 8 hours, divide E by 8x0.25 to obtain the capacity at that rate. If A is burned in 6 hours, divide E by 6x0.25 for that capacity.

No. of Boiler	294	295	296
When A is burned in 6 hours..............Steam	1650	1750	1850
Equivalent capacity.................Water	2630	2800	2960
When A is burned in 8 hours..............Steam	1240	1320	1400
Equivalent capacity.................Water	1980	2120	2240
When A is burned in 10 hours.............Steam	990	1050	1110
Equivalent capacity.................Water	1590	1680	1780
When A is burned in 12 hours.............Steam	825	875	925
Equivalent capacity.................Water	1320	1400	1480

See Page 51.

End Feed Sectional Steam and Water Boilers



Can Be Furnished with Double Feed Door for Wood Fuel and Grates for Pea Coal

These boilers present to the direct rays of the fire a very large percentage of heating surface, yet with a long fire travel to hold back the gases and prevent their too rapid escape to the smoke outlet. The "*Richardson*" Boilers have deep firepots and high combustion chambers.

All boilers have cored openings in back section for coil; and steam boilers are tapped on third section from front, right side, for indirect water heater. Steam Boilers can be fitted with fusible plugs.

21 Series End Feed Sectional

Steam

No.	Total Length Inches	Grate Area Sq. Ft.	Water Line Inches	*Outlets Inches	Ashpit (Inside) Inches	8 Hour Rating Sq. Ft.
214	36	2.27	43	1–3	22x24½	500
215	42¼	3.01	43	1–3	22x30¾	650
216	48½	3.75	43	2–3	22x37	800
217	54¾	4.49	43	2–3	22x43¼	925

Castings only, Height, 49½ in. Width, 32 in.

Water

No.	Total Length Inches	Grate Area Sq. Ft.	Water Line Inches	*Outlets Inches	Ashpit (Inside) Inches	8 Hour Rating Sq. Ft.
214	36	2.27	....	2–3	22x24½	800
215	42¼	3.01	....	2–3	22x30¾	1050
216	48½	3.75	....	3–3	22x37	1300
217	54¾	4.49	....	3–3	22x43¼	1500

* For each outlet there are two inlets of the same size—one on each side. Size of smoke-pipe, 9 in. For other measurements see Page 62.

Factors determining Boiler Capacities
(Derived from Actual Tests)

No. of Boiler—Steam and Water	214	215	216	217
A—Fuel available, hard coal....................lbs.	125	163	200	232
B—Rekindling reserve.........................lbs.	31	41	50	58
C—Adequate fuel charge (A+B)..............lbs.	156	204	250	290
D—Steam produced per pound coal (evaporative power)..............................lbs.	8.0	8.0	8.0	8.0
E—Total Steam (AxD) (Htg. power)..........lbs.	1000	1304	1600	1856
F—Area of square cornered chimney flue.....sq. in.	96	96	96	96
G—Height of chimney flue....................ft.	35	35	40	40

See tables regarding chimney flues. Page 37-BM.

Method for establishing Ratings

When load attached to boiler consists of direct radiation installed in a residence for 70 degrees, the heat-condensing power of the radiation and piping combined, rarely exceeds 0.25 (¼) pounds of steam per square foot per hour. The capacity of the "*Richardson*" Boilers as indicated in the following table is figured on this basis.

If load attached to boiler has a condensing power exceeding 0.25, such as occurs in factories and other buildings heated to a low temperature, or in which is used radiating surface having a greater condensing power, the factor representing the increased condensation, should be used.

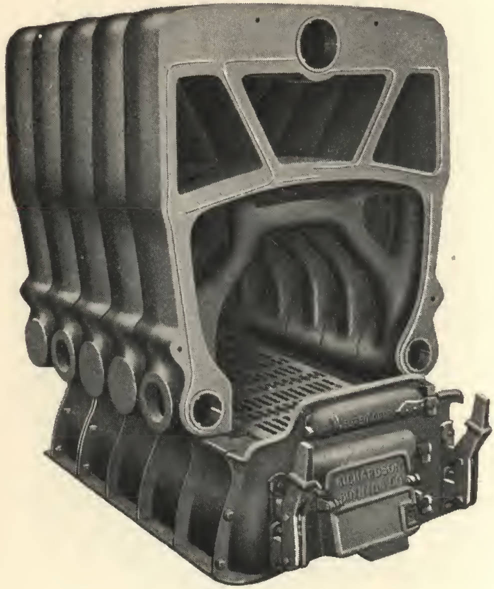
To convert line E to B.t.u., multiply by 970. When the hourly heat energy is expressed in terms of B.t.u., divide same by 250 for steam, or 150 for water.

If A is burned in 8 hours, divide E by 8x0.25 to obtain the capacity at that rate. If A is burned in 6 hours, divide E by 6x0.25 for that capacity.

No. of Boiler		214	215	216	217
When A is burned in 6 hours...............	Steam	667	867	1067	1233
Equivalent capacity.................	Water	1067	1400	1733	2000
When A is burned in 8 hours...............	Steam	500	650	800	925
Equivalent capacity.................	Water	800	1050	1300	1500
When A is burned in 10 hours..............	Steam	400	520	640	740
Equivalent capacity.................	Water	640	840	1040	1200
When A is burned in 12 hours..............	Steam	333	433	533	617
Equivalent capacity.................	Water	533	700	867	1000

See Page 51.

End Feed Sectional Steam and Water Boilers



Can Be Furnished with Double Feed Door for Wood Fuel and Grates for Pea Coal

Special care has been exercised in fitting these "*Richardson*" Boilers with ample provision for easy firing and cleaning. Two large upper doors furnish access to the flue surface for cleaning. The fire door is wide and high and through the slicer door all parts of the grate can be thoroughly cleaned. The ashpit is high and commodious for the easy removal of the ashes.

All boilers have cored openings in back section for coil; and steam boilers are tapped on third section from front, right side, for indirect water heater. Steam Boilers can be fitted with fusible plugs.

25 Series End Feed Sectional

Steam

No.	Total Length Inches	Grate Area Sq. Ft.	Water Line Inches	*Outlets Inches	Ashpit (Inside) Inches	8 Hour Rating Sq. Ft.
255	48¾	4.57	48¼	2–3½	27½x35½	1000
256	56	5.70	48¼	2–3½	27½x42¾	1250
257	63¼	6.83	48¼	2–3½	27½x50	1500
258	70½	7.97	48¼	2–3½	27½x57¼	1700

Castings only, Height, 55 in. Width, 39 in.

Water

255	48¾	4.57	....	2–3½	27½x35½	1600
256	56	5.70	....	3–3½	27½x42¾	2000
257	63¼	6.83	....	3–3½	27½x50	2400
258	70½	7.97	....	3–3½	27½x57¼	2800

* For each outlet there are two inlets of the same size, one on each side. Size of smoke-pipe, 12 in. For other measurements see Page 62.

Factors determining Boiler Capacities
(Derived from Actual Tests)

No. of Boiler		255	256	257	258
A—Fuel available, hard coal	lbs.	235	294	353	400
B—Rekindling reserve	lbs.	59	74	88	100
C—Adequate fuel charge (A+B)	lbs.	294	368	441	500
D—Steam produced per pound coal (evaporative power)	lbs.	8.5	8.5	8.5	8.5
E—Total steam (AxD) (Htg. power)	lbs.	1998	2499	3001	3400
F—Area of square cornered chimney flue	sq. in.	96	96	96	144
G—Height of chimney flue	ft.	35	40	40	50

See tables regarding chimney flues. Page 37-BM.

Method for establishing Ratings

When load attached to boiler consists of direct radiation installed in a residence for 70 degrees, the heat-condensing power of the radiation and piping combined, rarely exceeds 0.25 (¼) pounds of steam per square foot per hour. The capacity of the "*Richardson*" Boilers, as indicated in the following table is figured on this basis.

If load attached to boiler has a condensing power exceeding 0.25, such as occurs in factories and other buildings heated to a low temperature, or in which is used radiating surface having a greater condensing power, the factor representing the increased condensation should be used.

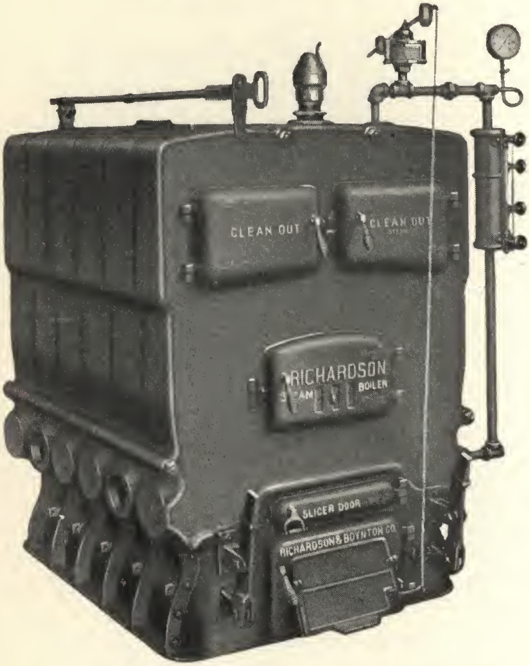
To convert line E to B.t.u., multiply by 970. When the hourly heat energy is expressed in terms of B.t.u., divide same by 250 for steam, or 150 for water.

If A is burned in eight hours, divide E by 8x0.25 to obtain the capacity at that rate. If A is burned in 6 hours, divide E by 6x0.25 for that capacity.

No. of Boiler		255	256	257	258
When A is burned in 6 hours	Steam	1333	1667	2000	2267
Equivalent capacity	Water	2133	2667	3200	3733
When A is burned in 8 hours	Steam	1000	1250	1500	1700
Equivalent capacity	Water	1600	2000	2400	2800
When A is burned in 10 hours	Steam	800	1000	1200	1360
Equivalent capacity	Water	1280	1600	1920	2240
When A is burned in 12 hours	Steam	667	833	1000	1133
Equivalent capacity	Water	1067	1333	1600	1867

See Page 51.

End Feed Sectional Steam and Water Boilers



Can Be Furnished with Double Feed Door for Wood Fuel and Grates for Pea Coal

The fitter is interested in a boiler that is not only efficient, but one that can be assembled in the shortest possible time, reducing labor charges. This is realized in all "*Richardson*" Boilers as they are assembled with machine cut tapered cast-iron nipples and tested and assembled at factory before delivery for structural strength and manufacturing precision.

All boilers have cored openings in back section for coil; and steam boilers are tapped on third section from front, right side, for indirect water heater. Steam Boilers can be fitted with fusible plugs.

35 Series End Feed Sectional

Steam

No.	Total Length Inches	Grate Area Sq. Ft.	Water Line Inches	*Outlets Inches	Ashpit (Inside) Inches	8 Hour Rating Sq. Ft.
355	47¼	7.85	56	2–4	39x33¼	1950
356	55½	9.81	56	2–4	39x41½	2400
357	64	11.75	56	3–4	39x50	2850
358	72¼	13.70	56	3–4	39x58¼	3300
359	80½	15.65	56	3–4	39x66½	3750

Castings only, Height, 63 in. Width, 48 in.

Water

355	47¼	7.85	....	3–4	39x33¼	3125
356	55½	9.81	....	3–4	39x41½	3850
357	64	11.75	....	4–4	39x50	4575
358	72¼	13.70	....	4–4	39x58¼	5300
359	80½	15.65	....	5–4	39x66½	6025

* For each outlet there are two inlets of the same size, one on each side. Size of smoke-pipe, 14 in. For other measurements see Page 62.

Factors determining Boiler Capacities
(Derived from Actual Tests)

No. of Boiler—Steam and Water	355	356	357	358	359
A—Fuel available, hard coal.............lbs.	459	565	671	777	882
B—Rekindling reserve..................lbs.	115	141	168	199	221
C—Adequate fuel charge (A+B).........lbs.	574	705	839	976	1103
D—Steam produced per pound coal (evaporative power)....................lbs.	8.5	8.5	8.5	8.5	8.5
E—Total Steam (AxD) (Htg. power)......lbs.	3902	4803	5704	6605	7497
F—Area of square cornered chimney flue, sq. in.	192	256	256	256	320
G—Height of chimney flue...............ft.	40	40	40	50	50

See tables regarding chimney flues. Page 37-BM.

Method for establishing Ratings

When load attached to boiler consists of direct radiation installed in a residence for 70 degrees, the heat-condensing power of the radiation and piping combined, rarely exceeds 0.25 (¼) pounds of steam per square foot per hour. The capacity of the "*Richardson*" Boilers as indicated in the following table is figured on this basis.

If load attached to boiler has a condensing power exceeding 0.25, such as occurs in factories and other buildings heated to a low temperature, or in which is used radiating surface having a greater condensing power, the factor representing the increased condensation, should be used.

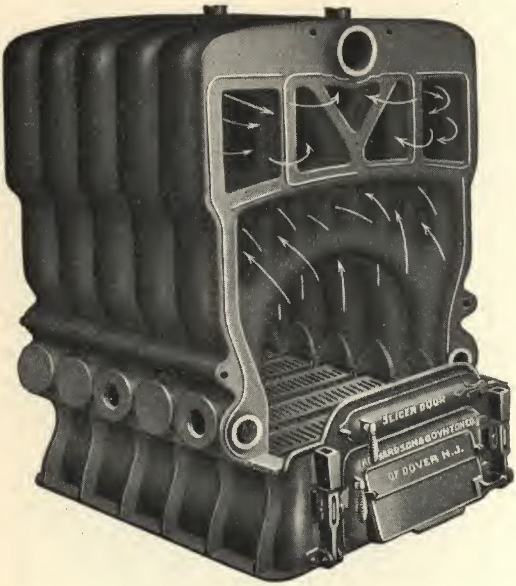
To convert line E to B.t.u., multiply by 970. When the hourly heat energy is expressed in terms of B.t.u., divide same by 250 for steam, or 150 for water.

If A is burned in 8 hours, divide E by 8x0.25 to obtain the capacity at that rate. If A is burned in 6 hours, divide E by 6x0.25 for that capacity.

No. of Boiler		355	356	357	358	359
When A is burned in 6 hours..........	Steam	2600	3200	3800	4400	5000
Equivalent capacity............	Water	4167	5133	6100	7067	8033
When A is burned in 8 hours..........	Steam	**1950**	**2400**	**2850**	**3300**	**3750**
Equivalent capacity............	Water	**3125**	**3850**	**4575**	**5300**	**6025**
When A is burned in 10 hours.........	Steam	1560	1920	2280	2640	3000
Equivalent capacity............	Water	2500	3080	3660	4240	4820
When A is burned in 12 hours.........	Steam	1300	1600	1900	2200	2500
Equivalent capacity............	Water	2083	2567	3050	3533	4017

See Page 51.

End Feed Sectional Steam and Water Boilers



Can Be Furnished with Double Feed Door for Wood Fuel and Grates for Pea Coal

The leg section shows in detail the features of the "*Richardson*" End Feed Sectional Boilers. The ample fire and combustion chamber with the low overhanging active fire surface; the thin water ways conducive to the rapid circulation of the water and the large flue spaces suitable for burning any quality of fuel. Connections between sections are made with extra heavy cast-iron slip nipples, making the boiler absolutely tight.

All boilers have cored openings in back section for coil; and steam boilers are tapped on third section from front, right side, for indirect water heater. Steam Boilers can be fitted with fusible plugs.

42 Series End Feed Sectional

Steam

No.	Total Length Inches	Grate Area Sq. Ft.	Water Line Inches	*Outlets Inches	Ashpit (Inside) Inches	8 Hour Rating Sq. Ft.
427	64	13.82	59	2–5	45x50	3500
428	72¼	16.11	59	2–5	45x58¼	4050
429	80½	18.40	59	2–5	45x66½	4600
4210	88¾	20.69	59	3–5	45x74¾	5150
4211	97	22.98	59	3–5	45x83	5700

Castings only, Height, 68 in. Depth, 54 in.

Water

No.	Total Length Inches	Grate Area Sq. Ft.	Water Line Inches	*Outlets Inches	Ashpit (Inside) Inches	8 Hour Rating Sq. Ft.
427	64	13.82	....	3–5	45x50	5600
428	72¼	16.11	....	3–5	45x58¼	6500
429	80½	18.40	....	3–5	45x66½	7400
4210	88¾	20.69	....	4–5	45x74¾	8300
4211	97	22.98	....	4–5	45x83	9200

* For each outlet there are two inlets of the same size, one on each side. Size of smoke-pipe, 16 in. For other measurements see Page 63.

Factors determining Boiler Capacities

(Derived from Actual Tests)

No. of Boiler—Steam and Water	427	428	429	4210	4211
A—Fuel available, hard coal...........lbs.	824	953	1083	1212	1342
B—Rekindling reserve................lbs.	206	238	271	303	336
C—Adequate fuel charge (A+B).......lbs.	1030	1191	1354	1515	1678
D—Steam produced per pound coal (evaporative power)..............lbs.	8.5	8.5	8.5	8.5	8.5
E—Total Steam (AxD) (Htg. power)....lbs.	7004	8101	9206	10302	11407
F—Area of square cornered chimney flue sq. in.	256	320	320	400	480
G—Height of chimney flue.............ft.	50	50	60	60	60

See tables regarding chimney flues. Page 37-BM.

Method for establishing Ratings

When load attached to boiler consists of direct radiation installed in a residence for 70 degrees, the heat-condensing power of the radiation and piping combined, rarely exceeds 0.25 (¼) pounds of steam per square foot per hour. The capacity of the "*Richardson*" Boilers as indicated in the following table is figured on this basis.

If load attached to boiler has a condensing power exceeding 0.25, such as occurs in factories and other buildings heated to a low temperature, or in which is used radiating surface having a greater condensing power, the factor representing the increased condensation, should be used.

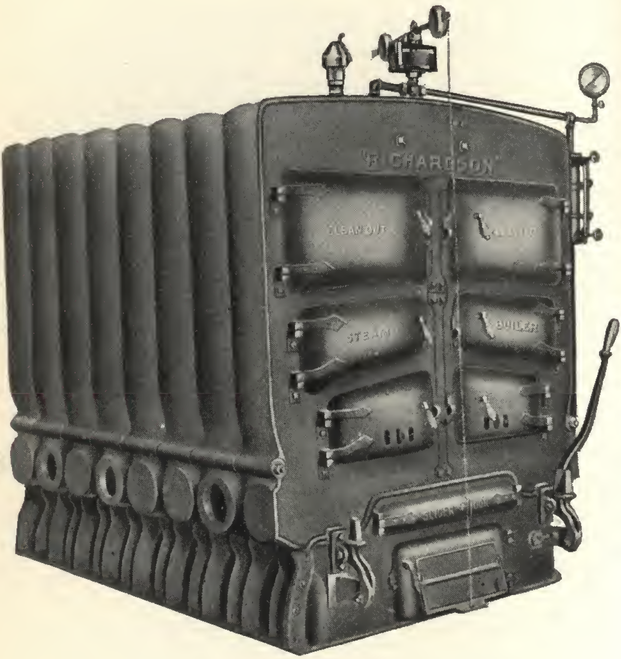
To convert line E to B.t.u., multiply by 970. When the hourly heat energy is expressed in terms of B.t.u., divide same by 250 for steam, or 150 for water.

If A is burned in 8 hours, divide E by 8x0.25 to obtain the capacity at that rate. If A is burned in 6 hours, divide E by 6x0.25 for that capacity.

No. of Boiler—Steam and Water		427	428	429	4210	4211
When A is burned in 6 hours........	Steam	4667	5400	6133	6867	7600
Equivalent capacity..........	Water	7467	8667	9867	11067	12267
When A is burned in 8 hours........	Steam	3500	4050	4600	5150	5700
Equivalent capacity..........	Water	5600	6500	7400	8300	9200
When A is burned in 10 hours.......	Steam	2800	3240	3680	4120	4560
Equivalent capacity..........	Water	4480	5200	5920	6640	7360
When A is burned in 12 hours.......	Steam	2333	2700	3067	3433	3800
Equivalent capacity..........	Water	3733	4333	4933	5533	6133

See Page 51.

End Feed Sectional Steam and Water Boilers



Can Be Furnished with Grates for Pea Coal

These boilers have been carefully and scientifically tested many times, and consequently the ratings can be relied upon. All the connections between sections are made with large, extra heavy cast-iron tapered slip nipples. The two halves of the back section are connected with a yoke, furnished with the boiler, so that the whole boiler can be drained.

All boilers have cored opening in back section for coil. Can also be tapped for indirect water heater. Steam Boilers can be fitted with fusible plugs.

53 Series End Feed Sectional

Steam

No.	Total Length Inches	Grate Area Sq. Ft.	Water Line Inches	*Outlets Ins.	Ashpit (Inside) Inches	Rating Sq. Ft.
536	78¼	18.94	70½	2–6	55x55	6300
537	89	22.68	70½	2–6	55x65¾	7300
538	99¾	26.40	70½	3–6	55x76½	8300
539	110½	30.12	70½	3–6	55x87¼	9300
5310	121¼	33.88	70½	3–6	55x98	10300

Castings only, Height, 82 in. Width, 69½ in.

Water

536	78¼	18.94	....	2–6	55x55	10000
537	89	22.68	....	2–6	55x65¾	11600
538	99¾	26.40	....	3–6	55x76½	13200
539	110½	30.12	....	3–6	55x87¼	14800
5310	121¼	33.88	....	3–6	55x98	16400

* For each outlet there are two 4-inch inlets on steam boilers—one on each side, and two 6-inch inlets on water boilers—one on each side; also two 4-inch returns in back section of each boiler. Size of smoke-pipe, 6 and 7 section, 17 in.; 8 section, 19 in.; 9 and 10 section, 21 in. For other measurements see Page 63.

Factors determining Boiler Capacities
(Derived from Actual Tests)

No. of Boiler—Steam and Water	536	537	538	539	5310
A—Fuel available, hard coal............lbs.	1112	1289	1465	1642	1810
B—Rekindling reserve................lbs.	278	322	388	411	455
C—Adequate fuel charge (A+B).......lbs.	1390	1611	1853	2053	2265
D—Steam produced per pound coal (evaporative power)..............lbs.	8.5	8.5	8.5	8.5	8.5
E—Total Steam (AxD) (Htg. power)....lbs.	9452	10957	12453	13957	15453
F—Area of square cornered chimney flue sq. in.	576	576	576	784	784
G—Height of chimney flue.............ft.	60	70	70	70	70

See tables regarding chimney flues. Page 37-BM.

Method for establishing Ratings

When load attached to boiler consists of direct radiation installed in a residence for 70 degrees, the heat-condensing power of the radiation and piping combined, rarely exceeds 0.25 (¼) pounds of steam per square foot per hour. The capacity of the "*Richardson*" Boilers as indicated in the following table is figured on this basis.

If load attached to boiler has a condensing power exceeding 0.25, such as occurs in factories and other buildings heated to a low temperature, or in which is used radiating surface having a greater condensing power, the factor representing the increased condensation, should be used.

To convert line E to B.t.u., multiply by 970. When the hourly heat energy is expressed in terms of B.t.u., divide same by 250 for steam, or 150 for water.

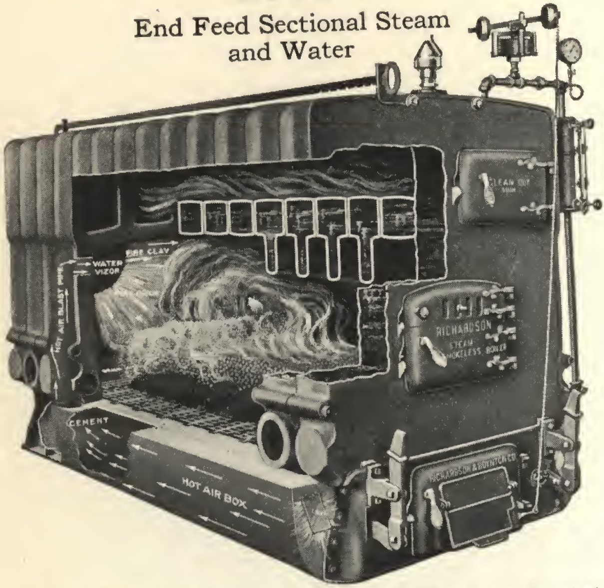
If A is burned in 8 hours, divide E by 8x0.25 to obtain the capacity at that rate. If A is burned in 6 hours, divide E by 6x0.25 for that capacity.

No. of Boiler	536	537	538	539	5310
When A is burned in 6 hours.....Steam	6300	7300	8300	9300	10300
Equivalent capacity.......Water	10000	11600	13200	14800	16400
When A is burned in 8 hours.....Steam	4725	5475	6225	6975	7725
Equivalent capacity.......Water	7500	8700	9900	11100	12300
When A is burned in 10 hours....Steam	3780	4380	4980	5580	6180
Equivalent capacity.......Water	6000	6960	7920	8880	9840

See Page 51.

Richardson Hot Blast Smokeless Boilers

End Feed Sectional Steam and Water



Special features of the "*Richardson*" Hot Blast Smokeless Boilers "C" Series.

They are made in sectional form and can be erected at any time, whether the building is new or old. This enables the boiler to be installed with a minimum handling expense.

The natural fire travel and draft eliminate excessive heights in chimneys.

Long smoke travel and no obstruction to the flames, aid combustion to the perfection point and utilize maximum heat from the fuel.

"Y" Flue Construction equalizes the circulation and assures a steady water line.

Overhanging prime heating surfaces are at the maximum, producing the highest evaporative power.

During the process of the fuel coking, gases are drawn back into a large chamber in front of the bridgewall, which has two port holes at the top center, making it impossible for gases to accumulate and explode.

The base is made in sections, permitting enlargement of a boiler if ever necessary.

Fire door: Replacing of grates through fire door big enough for man to enter (15x20 inches) means important saving in time. The size of this door permits even distribution of fuel over the fire.

Richardson Smokeless Boilers

STEAM Boilers—Data, Ratings and List Prices

No.	Total Length Inches	Grate Area Sq. Ft.	Water-line Inches	Outlets Number and Size	Inlets Number and Size	Ashpit Inside Inches	Size of Chimney Inches	Height of Chimney Ft.	Smoke-pipe Inches	Steam Rating Sq. Ft.
C-2075	65½	6.83	48¼	3–3½	6–3½	27½x 50	12x16	40	14	1850
C-2085	72¾	7.97	48¼	4–3½	8–3½	27½x 57¼	16x16	45	14	2150
C-2095	80	9.11	48¼	4–3½	8–3½	27½x 64½	16x20	50	14	2500
C-2105	87¼	10.25	48¼	4–3½	8–3½	27x71¾	16x20	50	14	2800
C-3075	68¾	11.75	56	4–4	8–4	39⅜x 50½	16x16	50	16	3800
C-3085	77	13.70	56	4–4	8–4	39⅜x 59	16x20	55	16	4450
C-3095	85¼	15.65	56	5–4	10–4	39⅜x67½	20x20	55	16	5100
C-3105	93½	17.60	56	5–4	10–4	39⅜x 76	20x20	60	16	5750
C- 742	64	13.82	59	3–5	6–5	45 x 50	20x20	50	20	5100
C- 842	72¼	16.11	59	3–5	6–5	45 x 58¼	20x20	55	20	5950
C- 942	80½	18.40	59	3–5	6–5	45 x 66½	20x20	60	20	6800
C-1042	88¾	20.69	59	4–5	8–5	45 x 74¾	20x20	65	20	7650
C-1142	97	20.69	59	4–5	8–5	45 x 74¾	20x24	65	20	8500
C-1242	105¼	20.69	59	4–5	8–5	45 x 74¾	20x24	70	20	9350
C-1342	113½	20.69	59	4–5	8–5	45 x 74¾	20x24	70	20	10200
C-1442	121¾	20.69	59	5–5	10–5	45 x 74¾	24x28	75	20	11050
C-1542	130	20.69	59	5–5	10–5	45 x 74¾	24x28	75	20	11900
C-1642	138¼	20.69	59	5–5	10–5	45 x 74¾	28x28	80	20	12750
C-1742	146½	20.69	59	5–5	10–5	45 x 74¾	28x28	85	20	13600
C-1842	154¾	20.69	59	6–5	12–5	45 x 74¾	30x30	90	20	14450
C-1942	163	20.69	59	6–5	12–5	45 x 74¾	30x30	95	20	15300
C-2042	171¼	20.69	59	6–5	12–5	45 x 74¾	30x30	100	20	16150

For other measurements see Page 65. For WATER boilers see Page 33.

Richardson Hot Blast Smokeless Boilers

End Feed Sectional Steam and Water

The Bridgewall Section

This section forms the rear end of front combustion chamber. It contains a water curtain faced with fire brick. Fire brick facing retains heat more readily and at an extremely high temperature. Air injected into the combustion chamber through the air blast section in front of the bridgewall, is heated by direct contact with this brick facing. This curtain effect forces the rising products of combustion to follow a circular motion before being drawn down underneath its lower edge. Two gas vents at the top center relieve any gas pockets.

The Air Blast Section

This section is designed with two hot air intakes, one on each side just under the crown sheet. Cast iron air ducts are attached to the outside, covering these air intakes and join boxes built on the side of the ash pit running to the front of the boiler. These form air channels leading directly into the front combustion chamber. The heat from the ash pit warms air as it travels in these boxes. Upon entering the front combustion chamber, the heated air crosses the hot brick on the bridgewall section. The high temperature of this air so greatly aids the general combustion that it eliminates all smoke, even with the poorest grades of coal.

Richardson Smokeless Boilers

WATER Boilers—Data, Ratings and List Prices

No.	Total Length Inches	Grate Area Sq. Ft.	Outlets Number and Size	Inlets Number and Size	Ashpit Inside Inches	Size of Chimney Inches	Height of Chimney Feet	Size Smoke Pipe Inches	Water Rating Sq. Ft.
C-2075	65½	6.83	3–3½	6–3½	27½x50	12x16	40	14	3000
C-2085	72¾	7.97	4–3½	8–3½	27½x57¼	16x16	45	14	3550
C-2095	80	9.11	4–3½	8–3½	27½x64½	16x20	50	14	4100
C-2105	87¼	10.25	4–3½	8–3½	27x71¾	16x20	50	14	4600
C-3075	68¾	11.75	4–4	8–4	39⅜x50½	16x16	50	16	6200
C-3085	77	13.70	4–4	8–4	39⅜x59	16x20	55	16	7300
C-3095	85¼	15.65	5–4	10–4	39⅜x67½	20x20	55	16	8400
C-3105	93½	17.60	5–4	10–4	39⅜x76	20x20	60	16	9500
C- 742	64	13.82	3–5	6–5	45x50	20x20	50	20	8400
C- 842	72¼	16.11	3–5	6–5	45x58¼	20x20	55	20	9800
C- 942	80½	18.40	3–5	6–5	45x66½	20x20	60	20	11200
C-1042	88¾	20.69	4–5	8–5	45x74¾	20x20	65	20	12600
C-1142	97	20.69	4–5	8–5	45x74¾	20x24	65	20	14000
C-1242	105¼	20.69	4–5	8–5	45x74¾	20x24	70	20	15400
C-1342	113½	20.69	4–5	8–5	45x74¾	20x24	70	20	16800
C-1442	121¾	20.69	5–5	10–5	45x74¾	24x28	75	20	18200
C-1542	130	20.69	5–5	10–5	45x74¾	24x28	75	20	19600
C-1642	138¼	20.69	5–5	10–5	45x74¾	28x28	80	20	21000
C-1742	146½	20.69	5–5	10–5	45x74¾	28x28	85	20	22400
C-1842	154¾	20.69	6–5	12–5	45x74¾	30x30	90	20	23800
C-1942	163	20.69	6–5	12–5	45x74¾	30x30	95	20	25200
C-2042	171¼	20.69	6–5	12–5	45x74¾	30x30	100	20	26600

For other measurements see Page 65. For STEAM boilers see Page 31.

Richardson Hot Blast Smokeless Boilers

Suggestions

1. In order to get the best results with firing tools, we recommend the suspension of a chain from the ceiling in front of firing door of boiler of the proper length with a hook to hold the poker or scraper while being used. This will make the tools much more easily handled.

2. We recommend that under no circumstances *mix the coals before recharging with fresh fuel.* The coals should be simply *broken*, the fresh fuel thrown on evenly throughout the entire fire chamber.

3. The cast plate which fits in the ashpit, to prevent the draft from going past the bridgewall section, should be placed just behind the last grate bar.

4. In erecting all "*Richardson*" Smokeless Boilers we consider the quickest way is to begin at the front and work toward the back.

5. We recommend all boilers be erected over a pit.

6. We recommend two or more boilers in large operations. This is particularly emphasized in factories, warehouses and apartments and assures continuous operation of the heating plant in case of one boiler being out of commission.

7. After the fire brick is placed on bridgewall section, the space above this brick should be filled in with fire clay to present a solid face to the fire.

8. The blank space behind the last grate bar in boiler, sizes Nos. 1142 to 2042, inclusive, should be filled in with either cement or dirt, at the same time placing fire bricks in a slanting position so as to produce an incline toward the back section. Sizes Nos. 1342 to 1542, inclusive, should be graded with filling and topped off with cement to a height of seven inches at the back section. Size No. 1642, 8 inches; size No. 1742, 9 inches; size No. 1842, 10 inches; size No. 1942, 11 inches; size No. 2042, 12 inches.

Richardson Hot Blast Smokeless Boilers

Suggestions (Continued)

In the last four sizes mentioned it is advisable to use fire bricks. Caution should be used to grade the incline as suggested, otherwise valuable fire surface will be lost. This arrangement provides an easy method of raking out ashes which sometimes accumulate behind the bridgewall.

9. The bridgewall section, unless otherwise ordered, will be located as follows: Nos. 2075, 3075, 742 as the fifth section; Nos. 2085, 3085, 842 as the sixth section; Nos. 2095, 3095, 942 as the seventh section; Nos. 2105, 3105, 1042 as the eighth section; Nos. 1142 to 2042 inclusive as the ninth section. The location of the bridgewall section is arrived at by considering the front section as No. 1.

Richardson Hot Blast Smokeless Boilers

Technical Facts—Approximate Chimney Flues—When the Full Rated Capacity is Operating Numbers of Boilers in Battery or Connected to One Chimney

No. of Boiler	1		2		3	
	Dimens. Inches	Height Feet	Dimens. Inches	Height Feet	Dimens. Inches	Height Feet
C-2075	12x16	40	16x16	50	20x20	60
C-2085	16x16	45	16x16	55	20x20	65
C-2095	16x20	50	24x24	60	24x24	70
C-2105	16x20	50	24x24	60	24x24	70
C-3075	16x16	50	20x24	60	24x24	70
C-3085	16x20	55	20x24	65	24x24	75
C-3095	20x20	55	20x24	65	28x28	75
C-3105	20x20	60	20x24	70	28x28	80
C- 742	20x20	50	24x24	60	28x28	70
C- 842	20x20	55	24x24	65	28x28	75
C- 942	20x20	60	24x28	70	30x30	80
C-1042	20x20	65	24x28	75	30x30	85
C-1142	20x24	65	28x28	75	30x36	85
C-1242	20x24	70	24x28	80	30x36	90
C-1342	20x24	70	28x28	80	30x36	90
C-1442	24x28	75	30x30	85	30x36	95
C-1542	24x28	75	30x30	85	30x36	95
C-1642	28x28	80	30x36	90	36x36	100
C-1742	28x28	85	30x36	95	36x36	105
C-1842	30x30	90	36x36	100	42x42	110
C-1942	30x30	95	36x36	105	42x42	115
C-2042	30x30	100	36x36	110	42x42	120

Clean Water Guaranteed by the Richardson Galvoxide Process

In many sections the chemical composition of the water makes it impossible to obtain clean hot water, free from rust or discoloration, except by using brass sections in the tank and laundry heaters. Five years ago the Richardson & Boynton Company perfected a new type of heater with a galvoxide water section so treated by a special process that it is not affected by the chemical properties in the water in any way whatsoever. The result is that clean hot water is available at all times.

Thousands of successful installations in the past five years have so established the Richardson Galvoxide Heater as a solution for the clean water problem that the Richardson & Boynton Company now guarantee their Galvoxide Water Heaters to keep the water free from rust or discoloration.

Architects and plumbers find the guaranteed Galvoxide Water Section so thoroughly satisfactory in all ways that they do not hesitate to recommend it without reservation to their clients.

Tank Heater Ratings

The capacities in gallons shown for the different styles of hot water Tank Heaters indicate the size of storage tank to which heater should be connected for ordinary domestic supply systems; and heaters have the capacity to impart from 25 to 40 degrees of heat per hour to the water, which fulfills the requirements of such systems.

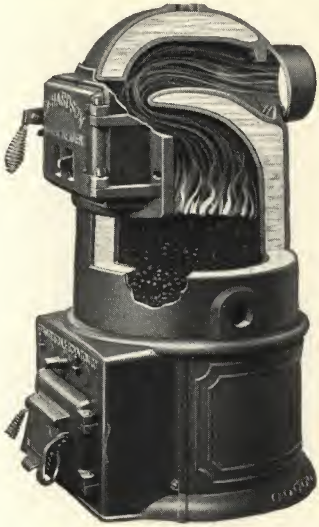
Where a specific quantity of water is required to be raised to a certain number of degrees per hour for special purposes, the boiler capacity required must be figured as follows:

Multiply the number of gallons to be heated per hour by $8\frac{1}{3}$ lbs., which is the weight of one gallon of water, and this result by the number of degrees temperature water is to be raised; divide this result by 8,000 (the heat units utilized from one pound of fuel), and the result will be the number of pounds of coal which must be burned per hour; this divided by the rate of combustion at which the boiler is to be run, will give the square feet of grate required. Example: What size boiler will be required to heat a swimming pool containing 2,000 gallons from 40 to 70 degrees in 4 hours? 2,000 gallons to be heated in 4 hours is equal to 500 gallons per hour. 500 multiplied by $8\frac{1}{3}$ equals 4,170 lbs. of water which, multiplied by 30, (which is the number of degrees the water is to be raised), equals 125,100 heat units required to raise 500 gallons of water 30 degrees in one hour. As 8,000 units is the value which can be utilized from one pound of fuel, 125,100 divided by 8,000 B.t.u. equals 16, which is the pounds of coal to be burned per hour, and burning 6 lbs. of coal per square foot of grate would require a heater with $2\frac{2}{3}$ square feet of grate surface.

Important

When water heaters are subject to an unusual pressure or when the pressure is increased in the night, or during fires, it is necessary to provide the system with a water pressure-reducing valve and relief valve.

Richardson
Hot Water and Tank Heaters



No. 110T-112T-114T

Fitted with Triangular Grates

Can be furnished with Grates for Pea Coal

Can be furnished with Cast Iron or Galvoxide Water Section

Size	Capacity in Gallons of Water	Capacity in Sq. Ft. of Radiation	Diameter of Grates, Inches	Tappings, Flow and Return, Ins.	Smoke Pipe	Height, Inches
110T	150	115	10	1¼	6	34
112T	250	200	12	2	6	36⅜
114T	350	280	14	2½	6	37⅞

For detailed measurements, see Page 66.

See Pages 37 and 38.

Richardson
Hot Water and Tank Heaters

No. 170-200-230

Fitted with Triangular Grates

Can be furnished with Grates for Pea Coal

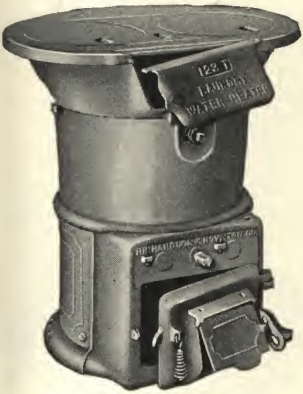
Size	Capacity in Gallons of Water	Capacity in Sq. Ft. of Radiation	Diameter of Grates, Inches	Tappings, Flow and Return Ins.	Smoke Pipe	Height, Inches
170	475	380	17	2-2½	7	42
200	600	480	20	2-3	8	42⅞
230	800	600	23	2-3	9	46

For detailed measurements, see Page 67.

See Page 38.

Hot Water Laundry Heaters

No. 123T, 23 inches high.



No. 124T, 26 inches high.

Top 24x16 inches.
Grate $10\frac{1}{2}$ inches.
Smoke-pipe $4\frac{1}{2}$ inches.
1-inch flow and return tappings.

Fitted with high ash pit and "Perfect" revolving grate bars.

No. 123T for 80 gallons

No. 124 for 150 gallons

Can be furnished with Cast Iron or Galvoxide Water Section

No. 115 Laundry Heater

Capacity 125 gallons.
Height $30\frac{7}{8}$ inches.
Grate 12 inches.
Smoke-pipe 6 inches.
$1\frac{1}{4}''$ floor and return tappings
One size only.

A course of fire brick under water section prevents ashes and dead coal from coming in contact with heating surface, insuring maximum efficiency.

Fitted with high ash pit and "Perfect" revolving grate bars.

430 sq. in. direct heating surface.

Can be furnished with Cast Iron or Galvoxide Water Section

See Pages 37 and 38.

Hot Water Laundry Heaters

No. 1-B Union Heater

Height 27½ inches.
Top 21x14¼ inches.
Capacity 40 gallons.
Smoke-pipe 6 inches.
1-inch flow and return tapping.

Can be furnished with Cast Iron or Galvoxide Water Section

The No. 1-B Heater has a course of fire brick under water section which prevents ashes and dead coal from coming in contact with heating surface, insuring maximum efficiency.

Leg Base fitted with draw center grate.

No. 4 Union Heater

Height 27½ inches.
Top 21x14¼ inches.
Capacity 50 gallons
Smoke-pipe 6 inches
1-inch flow and return tappings. Fitted with high ash pit and "Perfect" revolving grate bars.

Can be furnished with Cast Iron or Galvoxide Water Section

The No. 4 Heater has a course of fire brick under water section which prevents ashes and dead coal from coming in contact with heating surface, insuring maximum efficiency.

See Pages 37 and 38.

Hot Water Laundry Heaters

No. 123B, 28¾ inches high
Top 24 by 16 inches
Capacity 100 gallons
Grate 10½ inches
Smoke-pipe 4½ inches

1-inch flow and return tapping. Fitted with high ash pit and "Perfect" revolving grate bars. Brick ring prevents accumulation of dead ashes at bottom of water section.

Can be furnished with Cast Iron or Galvoxide Water Section

No. 55 "Perfect" Laundry Heater

Capacity 250 gallons
Height 26¼ inches
Top 28 inches square
Smoke Collar, 6 inches
Tapping, 1½ inches

Can be furnished with Cast Iron or Galvoxide Water Section

See pages 37 and 38.

Richardson Hot Water Heaters

Western Series Soft Coal

No. 601

—

Capacity
125 Gallons

Dimensions

Radiation, 65 feet
Height over all, 33 in.
Grate, 10 in.
Depth fire, 14 in.

Smoke pipe, 5 in.
Tappings, 1½ in.
Floor space, 14½″x20″
Fire door, 8″x6″

Fitted with Triangular Grates

See Page 38.

Richardson Hot Water and Laundry Heaters

Western Series Soft Coal

No. 411

100 Gallons

Radiation, 50 feet
Height over all, 27 in.
Grate, 10 in.
Depth of fire, 10 in.
Smoke pipe, 5 in.
Tappings, 1½ in.
Floor space, 18″ x 18″
Fire door, 6″ x 4½″

No. 1A

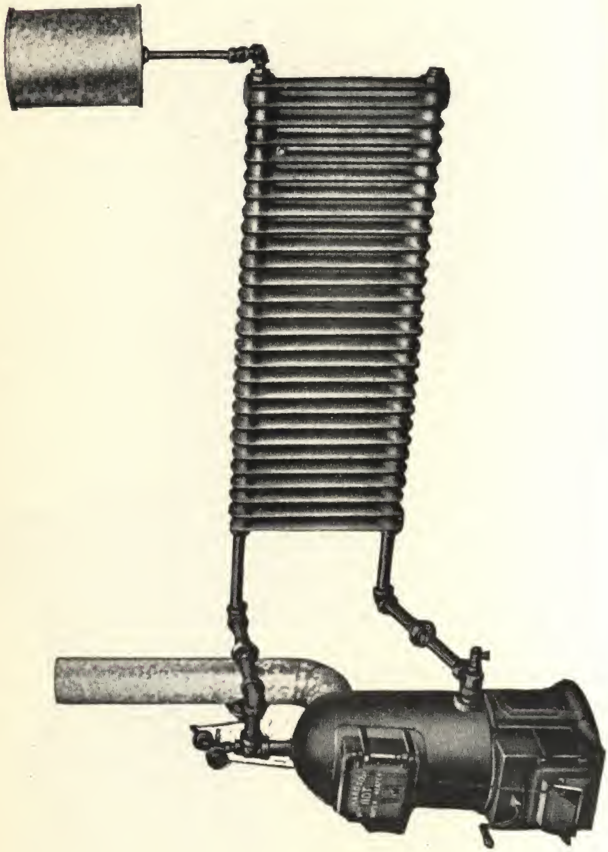
50 Gallons

Radiation, 25 feet
Height over all, 25½ in.
Grate, 9 in.
Depth of fire, 9 in.
Smoke pipe, 3¾″ x 7″
Tappings, 1 in.
Floor space, 18″ x 18″
Fire door, 6½″ x 4½″

See Page 38.

Richardson Automatic Garage Heater

Complete System for One-Car Garage



Richardson Automatic Garage Heating System

The advantages of the heated over the unheated garage are known and appreciated by every car owner. For the physician, professional or business man who uses a car or truck nearly every day in the year, a heated garage is practically a necessity. For small paint and repair shops, and many similar buildings which require heat, the compact, convenient and economical garage heater is thoroughly satisfactory. Owners of community garages find heat a paying investment because it obviates the principal disadvantage of this form of garage and permits better service.

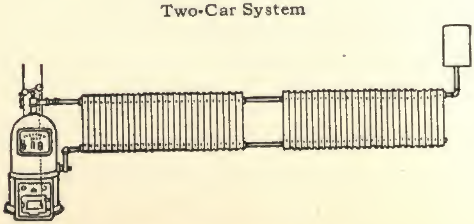
In the cases mentioned the question becomes, "What is the most satisfactory method of heating?" Save in exceptional circumstances, experience has proved that coal is still by far the most economical and satisfactory fuel for the purpose. Although the grates of the Richardson Garage Heater are adapted for any kind of fuel, chestnut size anthracite is recommended for best results. This heater is so efficient that the fuel cost is only a few cents a day. It requires attention only night and morning, because the special automatic regulator maintains a uniform temperature irrespective of weather conditions.

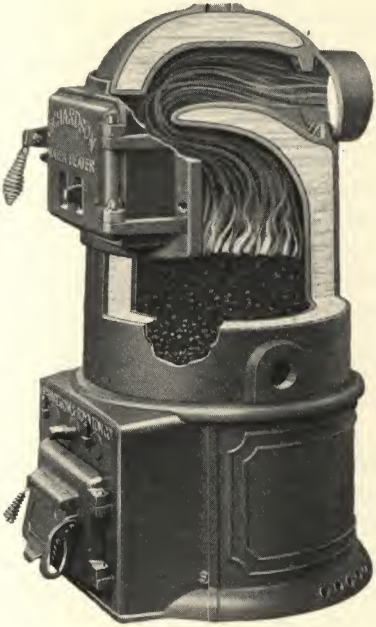
The Richardson Automatic Garage Heater

Is carefully constructed of the highest grade of iron and thoroughly tested before shipment. It is fitted with a high ash pit fitting close to the cement floor and with our celebrated "Perfect" triangular grate bars. The fire box is of sufficient depth to hold an ample supply of fuel and is cast in one piece. The grates are adapted for burning any kind of fuel—chestnut size anthracite is recommended for best results.

All parts being carefully cut and fitted, the necessary work in installing the Richardson Automatic System is most simple, requiring only a short time to set up heater, fasten water radiator to wall and make the connection. After the apparatus is set up, fill with water until it shows in the bottom of tank, start the fire, and adjust the regulator.

Two-Car System





Sectional View, Garage Heater

No. 110T

10-inch grate 34 inches high

No. 112T

12-inch grate $36\frac{3}{8}$ inches high

No. 114T

14-inch grate $37\frac{7}{8}$ inches high

For heater measurements only, see Page 66.

Cost of the Complete System

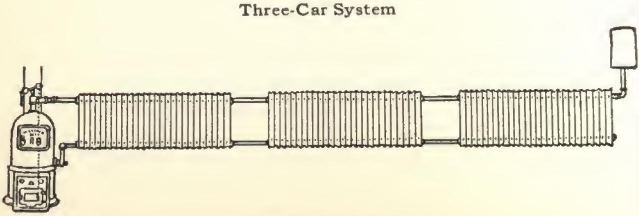
(Including everything ready to set up)

	List Price
One-Car Garage, with No. 110T Heater and one radiator	$110.00
Two-Car Garage, with No. 110T Heater and two radiators	145.00
Two-Car Garage, with No. 112T Heater and two radiators	165.00
Three-Car Garage, with No. 112T Heater and three radiators	90.001
Three-Car Garage, with No. 114T Heater and three radiators	215.00
Four-Car Garage, with No. 114T Heater and four radiators	240.00

Prices, F. O. B. shipping point.

For larger systems, special prices will be quoted.

Three-Car System



Important Facts

"*Richardson*" Boilers are rated according to accurate standards and upon the assumption that sufficient radiation will be used, the piping system properly arranged and the boiler connected to a flue of ample capacity and good draft, with steam at 2 lbs. boiler pressure and with hot water at a temperature of 180 degrees Fahrenheit.

Our ratings provide that all piping (mains, risers and returns), in addition to the direct radiation to be used, shall be figured as radiating surface in estimating the size of boiler necessary. One size larger boiler for reserve power is best used.

For indirect radiation add 75 per cent to surface for such radiation, and where pipe radiation surface is used, add 25 per cent for same to equal the usual amount direct radiation.

When a pipe coil or cast-iron section is placed in the firepot for heating water for domestic uses, additional capacity must be figured at the rate of 1½ square feet of direct radiation for a steam boiler and 2½ square feet of direct radiation for a hot-water boiler, for each gallon of water to be heated per hour.

"*Richardson*" Boilers are tapped for coils to be placed in the firebox for heating water.

Do not bush outlets on boilers; connect all of them full size to the mains.

To secure best results boilers should be covered with asbestos cement.

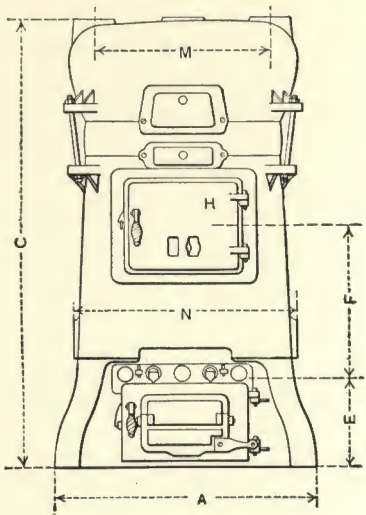
Guarantee

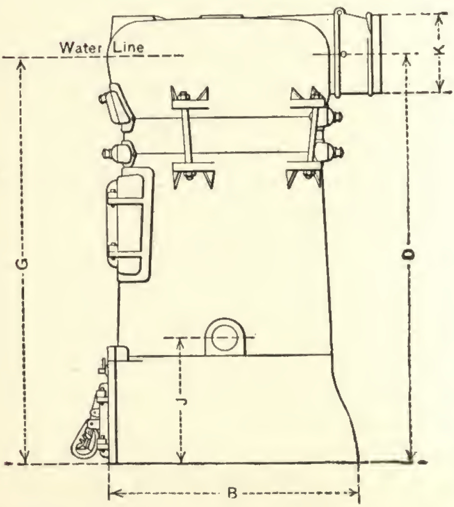
Every "*Richardson*" Boiler is sold under a guarantee as to its perfection in manufacture, and its ability to carry the rating shown in our printed matter, provided that a sufficient amount of radiation is installed, the piping system properly run, and the boiler connected to a flue of sufficient size and draft for the size of the fire box.

Coal

"*Richardson*" Boilers can be furnished with grates to burn the small sizes of coal when so ordered.

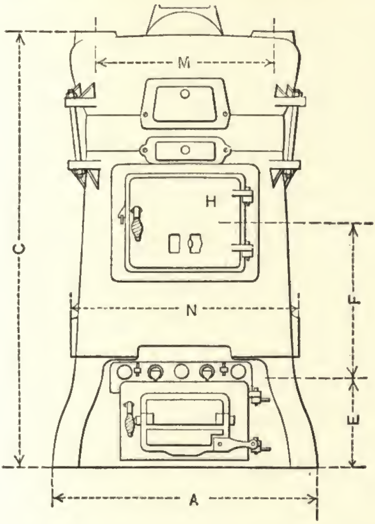
Round Sectional Steam Boilers

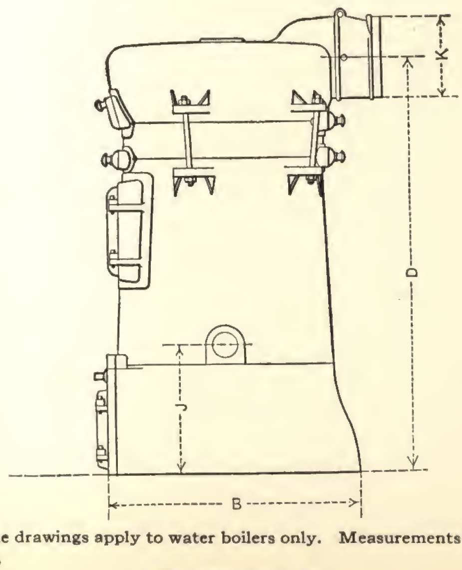




These line drawings apply to steam boilers only. Measurements are given on Page 54.

Round Sectional Water Boilers





These line drawings apply to water boilers only. Measurements are given on Page 54.

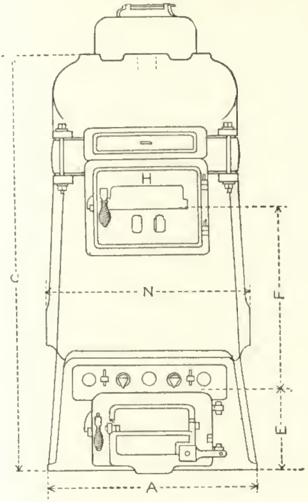
Round Boiler Measurements

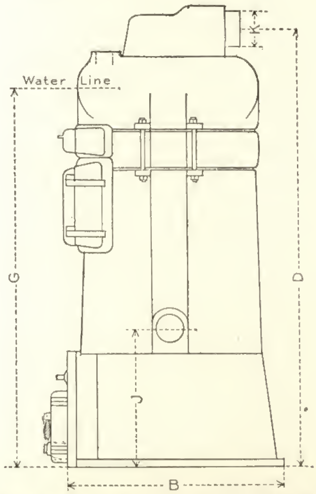
Table of distances between points as indicated on line drawings, Pages 52 and 53. All measurements are given in inches

	For Steam and Water										For Steam Only		For Water Only
Size	A	B	D	E	F	H	J	K	M	N	C	G	C
190	30¼	28¼	45⅜	10	17½	10 x12½	14⅜	8	20⅛	25½	47½	42½	45¼
191	30¼	28¼	49⅝	10	17½	10 x12½	14⅜	8	20⅛	25½	51½	46½	49¼
192	30¼	28¼	53⅝	10	17½	10 x12½	14⅜	8	20⅛	25½	55½	50½	53¼
221	33¼	32	50⅝	10½	18	10 x13¾	15½	9	22	28	53	48¼	50½
222	33¼	32	55¼	10½	18	10 x13¾	15½	9	22	28	57	52¼	54½
223	33¼	32	59¼	10½	18	10 x13¾	15½	9	22	28	61	56¼	58½
251	36	34½	52¼	11¼	18	10 x15½	16¼	10	24⅞	31⅜	54¼	49½	52
252	36	34½	56¼	11¼	18	10 x15½	16¼	10	24⅞	31⅜	58¼	53½	56
253	36	34½	60⅜	11¼	18	10 x15½	16¼	10	24⅞	31⅜	62¼	57½	60
281	40	38¼	53¾	11¼	18	10½x16	16⅞	10	28	34¾	55¾	51	53¼
282	40	38¼	57¾	11¼	18	10½x16	16⅞	10	28	34¾	59¾	55	57¼
283	40	38¼	62	11¼	18	10½x16	16⅞	10	28	34¾	63¾	59	61¼

Round Sectional Steam Boilers

Nos. 417 to 1629

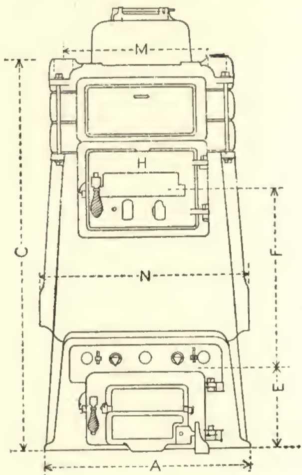


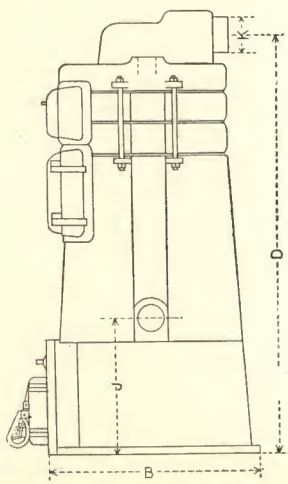


These line drawings apply to round steam boilers Nos. 417 to 1629. Measurements are given on Page 57.

Round Sectional Water Boilers

Nos. 417 to 1629





These line drawings apply to Round Water Boilers Nos. 417 to 1629. Measurements are given on Page 57.

Round Boiler Measurements

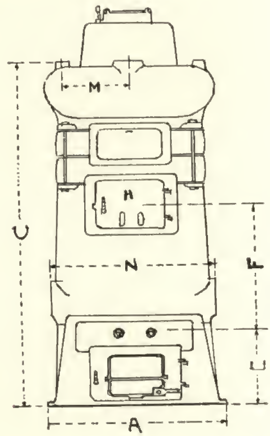
Nos. 417 to 1629

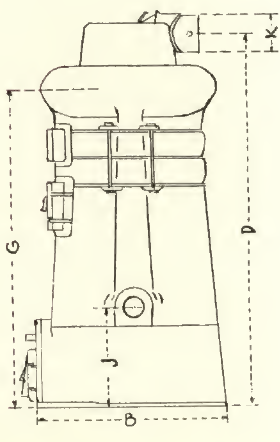
Table of distances between points as indicated on line drawings, Pages 55 and 56. All measurements are given in inches

	Steam and Water								For Steam Only			For Water Only		
No.	A	B	E	F	H	J	K	N	C	D	G	C	D	M
417	24	25¼	12	19¼	9 x11½	14½	7	23½	49¾	52¾	44¾	43	46	17
517	24	25¼	12	19¼	9 x11½	14½	7	23½	53¾	56¾	48¾	47	50	17
420	27	28½	12½	20	9½x12½	15½	8	26¾	50½	54	45½	43¾	47¼	19½
520	27	28½	12½	20	9½x12½	15½	8	26¾	54½	58	49½	47¾	51¼	19½
423	30	31½	13½	20½	9½x13½	16½	9	29¾	53½	57½	47½	46¼	50¼	22½
523	30	31½	13½	20½	9½x13½	16½	9	29¾	57½	61½	51½	50¼	54¼	22½
426	33½	35	14	22	9½x15½	17½	10	32¾	55	59	48½	47	51	24¾
526	33½	35	14	22	9½x15½	17½	10	32¾	59	63	52½	51	55	24¾
1429	38	40	13½	22¼	10 x15½	18	10	35¾	59⅜	63⅞	53½	50⅝	54⅞	24 15/16
1529	38	40	13½	22¼	10 x15½	18	10	35¾	64⅝	69⅛	58¾	55⅞	60⅜	24 15/16
1629	38	40	13½	22¼	10 x15½	18	10	35¾	69⅞	74⅜	64	61	65⅝	24 15/16

Round Sectional Steam Boilers

Western Series Nos. 173 to 296

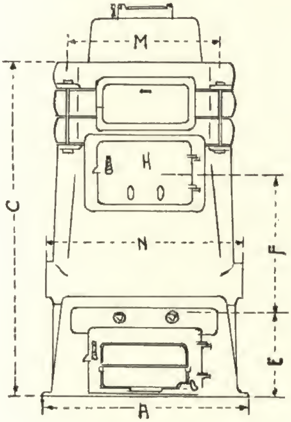


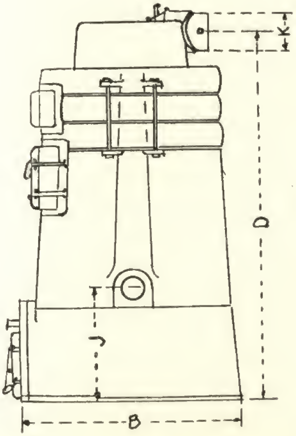


These line drawings apply to Western Series steam boilers only. Measurements are given on Page 60.

Round Sectional Water Boilers

Western Series Nos. 173 to 296





These line drawings apply to Western Series water boilers only. Measurements are given on Page 60.

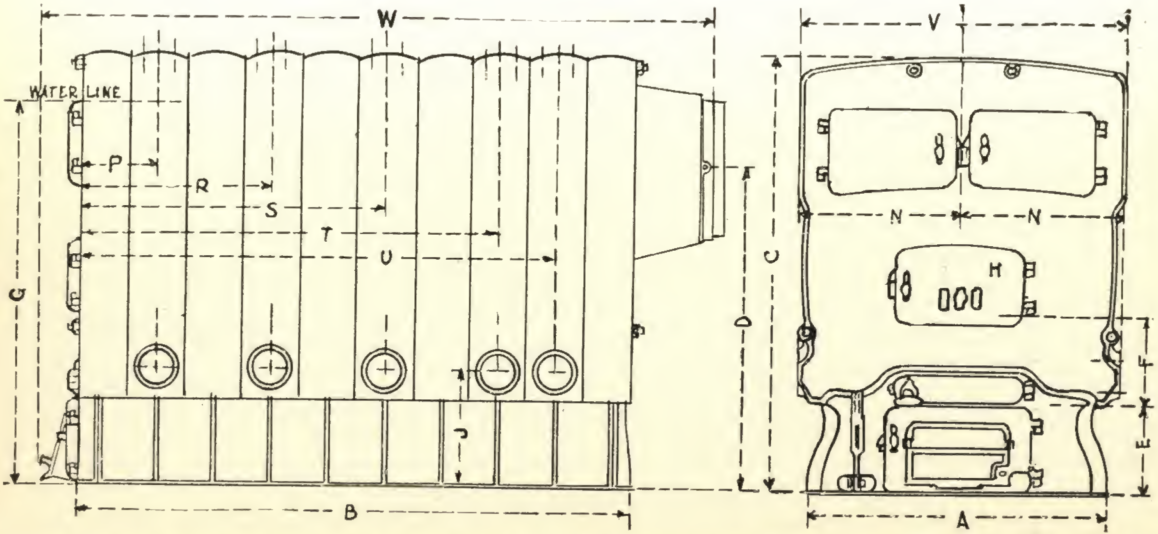
Round Boiler Measurements

Western Series Nos. 173 to 296

Table of distances between points as indicated on line drawings, Pages 58 and 59. All measurements are given in inches

	Steam and Water								Steam Only				Water Only		
No.	A	B	E	F	H	J	K	N	C	D	G	½M	C	D	M
173	24	25¼	12	19¼	9 x11½	14½	7	23½	45¾	48¾	40¾	8½	39	42	17
174	24	25¼	12	19¼	9 x11½	14½	7	23½	49¾	52¾	44¾	8½	43	46	17
175	24	25¼	12	19¼	9 x11½	14½	7	23½	53¾	56¾	48¾	8½	47	50	17
203	27	28½	12½	20	9½x12½	15½	8	26¾	46½	50	41½	9¾	39¾	43¼	19½
204	27	28½	12½	20	9½x12½	15½	8	26¾	50½	54	45½	9¾	43¾	47¼	19½
205	27	28½	12½	20	9½x12½	15½	8	26¾	54½	58	49½	9¾	47¾	51¼	19½
233	30	31½	13½	20½	9½x13½	16½	9	29¾	49½	53½	43½	11¼	42¼	46¼	22½
234	30	31½	13½	20½	9½x13½	16½	9	29¾	53½	57½	47½	11¼	46¼	50¼	22½
235	30	31½	13½	20½	9½x13½	16½	9	29¾	57½	61½	51½	11¼	50¼	54¼	22½
263	33½	35	14	22	9½x15½	17½	10	32¾	51	55	44½	12¼	43	47	24¾
264	33½	35	14	22	9½x15½	17½	10	32¾	55	59	48½	12¼	47	51	24¾
265	33½	35	14	22	9½x15½	17½	10	32¾	59	63	52½	12¼	51	55	24¾
294	38	40	13½	22¼	10 x15½	18	10	35¾	59⅜	63⅞	53½	12½	50⅝	54⅞	24 15/16
295	38	40	13½	22¼	10 x15½	18	10	35¾	64⅝	69⅛	58¾	12½	55⅞	60⅜	24 15/16
296	38	40	13½	22¼	10 x15½	18	10	35¾	69⅞	74⅜	64	12½	61	65⅝	24 15/16

Sectional Boiler Measurements



These line drawings represent both steam and water boilers 21, 25, 35, 42 and 53 Series. Measurements are given on Pages 62 and 63.

Sectional Boiler Measurements

Table of distances between points as indicated on line drawings on Page 61. All measurements are given in inches and apply to all sizes 21-25 and 35 series, end feed

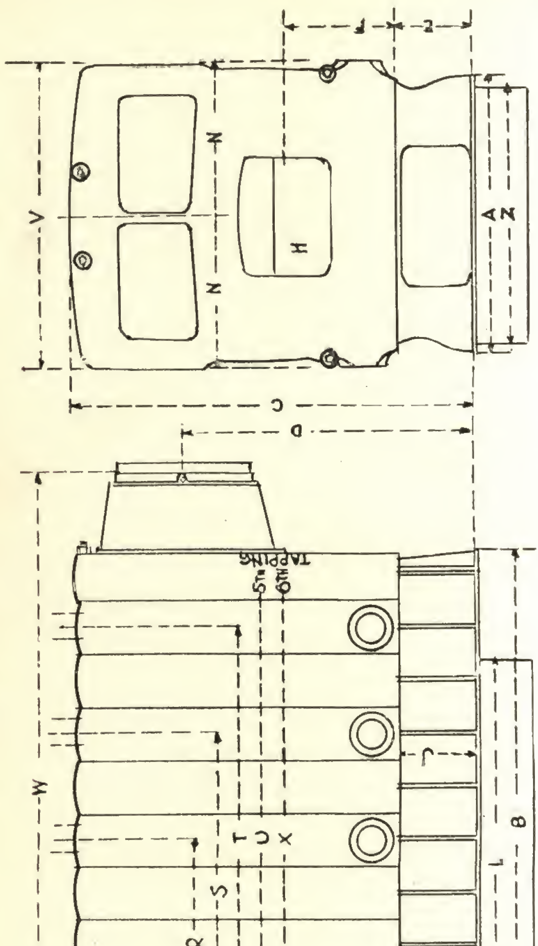
	Steam and Water												Steam				Water				
No.	A	B	C	D	E	F	H	J	K	N	V	W	G	P	R	S	P	R	S	T	U
214	25 3/4	25	49 1/2	38 7/8	11 1/2	14	9 3/4x15 3/4	14 7/8	9	15 1/8	32	36	43	15 1/8	....	....	8 7/8	15 1/8	....		
215	25 3/4	31 1/4	49 1/2	38 7/8	11 1/2	14	9 3/4x15 3/4	14 7/8	9	15 1/8	32	42 1/4	43	21 3/8	....	....	8 7/8	21 3/8	....		
216	25 3/4	37 1/2	49 1/2	38 7/8	11 1/2	14	9 3/4x15 3/4	14 7/8	9	15 1/8	32	48 1/2	43	8 7/8	27 3/8	....	8 7/8	21 3/8	27 5/8		
217	25 3/4	43 3/4	49 1/2	38 7/8	11 1/2	14	9 3/4x15 3/4	14 7/8	9	15 1/8	32	54 3/4	43	8 7/8	33 7/8	....	8 7/8	21 3/8	33 7/8		
255	32 3/4	35 3/4	55	43	11 1/2	14 1/2	10 1/4x17 3/4	15 1/2	12	18	39 3/8	48 3/4	48 1/4	10 1/4	24 3/4	....	10 1/4	24 3/4	....		
256	32 3/4	43	55	43	11 1/2	14 1/2	10 1/4x17 3/4	15 1/2	12	18	39 3/8	56	48 1/4	10 1/4	32	....	10 1/4	24 3/4	32		
257	32 3/4	50 1/4	55	43	11 1/2	14 1/2	10 1/4x17 3/4	15 1/2	12	18	39 3/8	63 1/4	48 1/4	10 1/4	39 1/4	....	10 1/4	24 3/4	39 1/4		
258	32 3/4	57 1/2	55	43	11 1/2	14 1/2	10 1/4x17 3/4	15 1/2	12	18	39 3/8	70 1/2	48 1/4	10 1/4	46 1/2	....	10 1/4	32	46 1/2		
355	44	40 1/2	63	49 1/2	13	13	11x18	17	14	23 1/2	48	47 1/4	56	11 5/16	27 15/16	....	11 5/16	19 5/8	27 15/16		
356	44	48 3/4	63	49 1/2	13	13	11x18	17	14	23 1/2	48	55 1/2	56	11 5/16	36 3/4	....	11 5/16	27 15/16	36 1/4		
357	44	57	63	49 1/2	13	13	11x18	17	14	23 1/2	48	64	56	11 5/16	27 15/16	44 9/16	11 5/16	27 15/16	36 1/4	44 9/16	
358	44	65 1/2	63	49 1/2	13	13	11x18	17	14	23 1/2	48	72 3/4	56	11 5/16	36 1/4	52 7/8	11 5/16	27 15/16	44 9/16	52 7/8	
359	44	73 3/4	63	49 1/2	13	13	11x18	17	14	23 1/2	48	80 1/2	56	11 5/16	36 1/4	61 3/16	11 5/16	27 15/16	44 9/16	52 7/8	61 3/16

Sectional Boiler Measurements

Table of distances between points as indicated on line drawings on page 61. All measurements are given in inches and apply to all sizes 42 and 53 series, end feed

	Steam and Water												Steam				Water			
No.	A	B	C	D	E	F	H	J	K	N	V	W	G	P	R	S	P	R	S	T
427	50	57	68	50 1/2	13	14	11x20	17	16	26 1/2	54	64	59	11 5/16	44 9/16	......	11 5/16	27 15/16	44 9/16	
428	50	65 1/2	68	50 1/2	13	14	11x20	17	16	26 1/2	54	72 1/4	59	11 5/16	52 7/8	......	11 5/16	36 1/4	52 7/8	
429	50	73 1/4	68	50 1/2	13	14	11x20	17	16	26 1/2	54	80 1/2	59	11 5/16	61 3/16	......	11 5/16	36 1/4	61 3/16	
4210	50	82	68	50 1/2	13	14	11x20	17	16	26 1/2	54	88 3/4	59	11 5/16	44 9/16	69 1/2	11 5/16	36 1/4	52 7/8	69 1/2
4211	50	90 1/4	68	50 1/2	13	14	11x20	17	16	26 1/2	54	97	59	11 5/16	44 9/16	77 13/16	11 5/16	36 1/4	61 3/16	77 13/16
536	61 3/4	61 1/4	82	60 7/8	14 7/8	17	13x21	20 5/8	17	34 5/8	69 1/2	78 1/4	70 1/2	13 3/4	46	......	13 3/4	46	.....	
537	61 3/4	72	82	60 7/8	14 7/8	17	13x21	20 5/8	17	34 5/8	69 1/2	89	70 1/2	13 3/4	56 3/4	......	13 3/4	56 1/4	.....	
538	61 3/4	82 3/4	82	60 7/8	14 7/8	17	13x21	20 5/8	19	34 5/8	69 1/2	99 3/4	70 1/2	13 3/4	46	67 1/2	13 3/4	46	67 1/2	
539	61 3/4	93 1/2	82	60 7/8	14 7/8	17	13x21	20 5/8	21	34 5/8	69 1/2	110 1/2	70 1/2	13 3/4	46	78 3/4	13 3/4	46	78 1/4	
5310	61 3/4	104 1/4	82	60 7/8	14 7/8	17	13x21	20 5/8	21	34 5/8	69 1/2	121 1/4	70 1/2	13 3/4	56 3/4	89	13 3/4	56 1/4	89	

Smokeless Boiler Measurements



These line drawings represent smokeless steam and water boilers. Measurements are given on page 65.

Smokeless Boiler Measurements

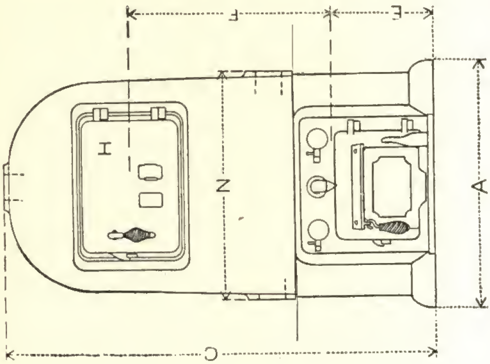
Tables of distances between points as indicated on line drawings Page 64. All measurements are given in inches and apply to 25 and 35 Series Smokeless only

No.	A	B	C	D	E	F	G	H	J	K	L	N	V	W	Z	P	R	S	T	U	X
C-2075	32¾	50¼	55	42¼	11½	14½	48	13 x16	15½	14	50	18	39⅜	65½	23	10¼	32	39¼			
C-2085	32¾	57½	55	42¼	11½	14½	48	13 x16	15½	14	57¼	18	39⅜	72¾	23	10¼	24¾	39¼	46½		
C-2095	32¾	64¾	55	42¼	11½	14½	48	13 x16	15½	14	64½	18	39⅜	80	23	10¼	24¾	46½	53¾		
C-2105	32¾	72	55	42¼	11½	14½	48	13 x16	15½	14	71¾	18	39⅜	87¼	23	10¼	24¾	53¾	61		
C-3075	44	57	63	49½	13	13	56	14½x18	17	16	50½	23½	48	68¾	35	11 5/16	20⅛	37¾	46 9/16		
C-3085	44	65½	63	49½	13	13	56	14½x18	17	16	59	23½	48	77	35	11 5/16	29 9/16	46 9/16	55⅝		
C-3095	44	73¾	63	49½	13	13	56	14½x18	17	16	67½	23½	48	85¼	35	11 5/16	20⅛	55⅝	64 7/16		
C-3105	44	82¼	63	49½	13	13	56	14½x18	17	16	76	23½	48	93½	35	11 5/16	29 9/16	46 9/16	64 7/16	73¼	

All measurements are given in inches and apply to 42 Series Smokeless only

No.	A	B	C	D	E	F	G	H	J	K	L	N	V	W	Z	P	R	S	T	U	X
C- 742	50	57	68	47¾	13	18	59	16x22	17	20	48⅛	26½	54	68	41	11 5/16	36¼	44 9/16			
C- 842	50	65¼	68	47¾	13	18	59	16x22	17	20	56 7/16	26½	54	76¼	41	11 5/16	44 9/16	52⅞			
C- 942	50	73¾	68	47¾	13	18	59	16x22	17	20	64¾	26½	54	84¾	41	11 5/16	52⅞	61 3/16			
C-1042	50	82	68	47¾	13	18	59	16x22	17	20	73 1/16	26½	54	93	41	11 5/16	36¼	61 3/16	69½		
C-1142	50	90¼	68	47¾	13	18	59	16x22	17	20	81⅜	26½	54	101¼	41	11 5/16	36¼	69½	77 13/16		
C-1242	50	98½	68	47¾	13	18	59	16x22	17	20	89 11/16	26½	54	109½	41	11 5/16	44 9/16	77 13/16	86⅛		
C-1342	50	107	68	47¾	13	18	59	16x22	17	20	89 11/16	26½	54	118	41	11 5/16	44 9/16	77 13/16	94 7/16		
C-1442	50	115¼	68	47¾	13	18	59	16x22	17	20	98	26½	54	126¼	41	11 5/16	36¼	61 3/16	86⅛	102¾	
C-1542	50	123½	68	47¾	13	18	59	16x22	17	20	98	26½	54	134½	41	11 5/16	36¼	61 3/16	86⅛	111 1/16	
C-1642	50	131¾	68	47¾	13	18	59	16x22	17	20	98	26½	54	142¾	41	11 5/16	36¼	61 3/16	86⅛	119⅜	
C-1742	50	140¼	68	47¾	13	18	59	16x22	17	20	98	26½	54	151¼	41	11 5/16	36¼	61 3/16	86⅛	127 11/16	
C-1842	50	148½	68	47¾	13	18	59	16x22	17	20	98	26½	54	159½	41	11 5/16	36¼	61 3/16	86⅛	111 1/16	136
C-1942	50	156¾	68	47¾	13	18	59	16x22	17	20	98	26½	54	167¾	41	11 5/16	36¼	61 3/16	86⅛	111 1/16	144 5/16
C-2042	50	165	68	47¾	13	18	59	16x22	17	20	98	26½	54	176	41	11 5/16	36¼	61 3/16	86⅛	119⅜	152⅝

Tank Heater Measurements



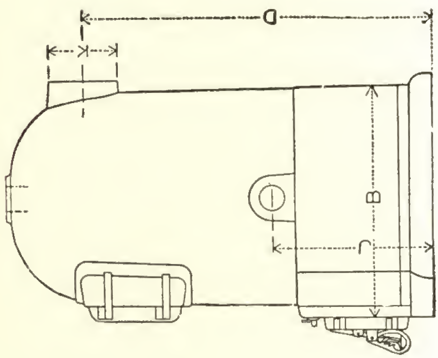
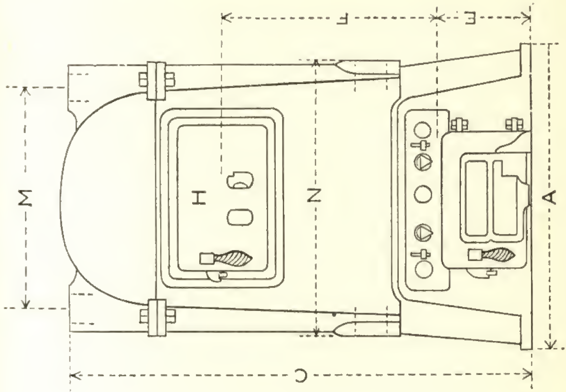


Table of distances between points as indicated on line drawings shown above

All measurements are given in inches

No.	A	B	C	D	E	F	H	J	K	N
110T	17	16½	34¼	28	10	15	7¾x 9¼	13¾	6	15½
112T	20	19½	36½	30¼	11	16	8 x10¾	15	6	17¾
114T	22½	22	38	31¼	11	16	8¼x11¼	15½	6	20

Tank Heater Measurements



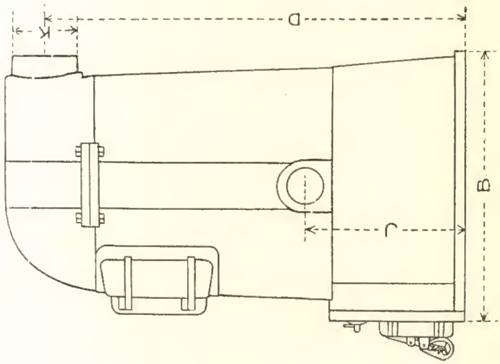


Table of distances between points as indicated on line drawings shown above

All measurements are given in inches

No.	A	B	C	D	E	F	H	J	K	M	N
170	24	25¼	43¼	38	12	16½	9 x11½	14½	7	16	23½
200	27	28½	43¼	39¼	12½	17½	9½x12½	15½	8	18¾	26¾
230	30	31½	48¾	41¾	13½	17½	9½x13½	16½	9	21¾	29¾

Asbestos Covering

The following is a list of the amount of asbestos cement required to cover $1\frac{1}{4}$ inches thick the different sizes of "*Richardson*" Boilers:

Round Steam and Water Boilers		Sectional Steam and Water Boilers	
No.	Pounds	No.	Pounds
190	125	214	200
191	150	215	225
192	150	216	250
221	175	217	275
222	200	255	300
223	200	256	350
251	225	257	400
252	225	258	450
253	250	355	400
281	250	356	450
282	250	357	500
283	275	358	550
417	100	359	600
517	115	427	550
420	125	428	600
520	150	429	650
423	175	4210	700
523	200	4211	750
426	225	536	800
526	250	537	900
1429	275	538	1000
1529	275	539	1100
1629	300	5310	1200

See next page for other sizes

Asbestos Covering

The following is a list of the amount of asbestos cement required to cover 1¼ inches thick the different sizes of "*Richardson*" Boilers.

Round Steam and Water Boiler Western Series

No.	Pounds
173	100
174	110
175	135
176	145
203	150
204	175
205	175
206	185
233	185
234	195
235	225
236	240
263	240
264	245
265	250
266	260
293	265
294	275
295	275
296	300

Smokeless Sectional Steam and Water Boilers

No.	Pounds
C-2075	400
C-2085	450
C-2095	500
C-2105	550
C-3075	500
C-3085	550
C-3095	600
C-3105	650
C- 742	600
C- 842	650
C- 942	700
C-1042	750
C-1142	800
C-1242	850
C-1342	900
C-1442	950
C-1542	1000
C-1642	1050
C-1742	1100
C-1842	1150
C-1942	1200
C-2042	1250

RICHARDSON

"PERFECT" WARM AIR HEATERS

Richardson & Boynton Co.

Manufacturers of

"Richardson" "Perfect"

Heating and Cooking Apparatus

Since 1837

Executive Offices: New York: 260 Fifth Avenue

Boston: 60 High Street
Philadelphia: 1308 Arch Street
Buffalo: 220 Delaware Avenue
Newark: 585 So. 21st Street
Chicago: 3641 So. Ashland Ave.
Minneapolis, Minn.: 100 N. 7th St.
Providence: 58 Exchange Street
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St. Louis: 705 Olive Street
Cleveland, O.: 2032 E. 22nd St.
Springfield, Mass.: 194 Chestnut Street

Introductory

The following pages which show the "Perfect" Warm Air Heaters are for dealer use only. They show data of measurements, details of construction and capacities.

We have tried to eliminate all detail which is not useful to you and yet have the necessary data easily available.

We emphasize only the essential features of construction which distinguish these particular heaters from those of other manufacture.

This data is for your use in selling your client.

We have separate literature with plenty of verbal description for distribution to your client and would suggest that you keep a sufficient stock available.

One of these pamphlets describing the particular heater which you have specified gives emphasis to your estimate and gains the confidence of your customer.

We would suggest that you use them liberally.

Many of your clients would be pleased to receive the details of a new or replacement installation, and we are prepared to give you complete specifications with blueprint layout whenever you think it will be useful.

Guarantee

We guarantee that the "Perfect" Warm Air Heaters are made of best quality materials and are of first class workmanship.

We will replace without charge any parts which prove to be defective in materials or workmanship.

The ratings or capacity in square inches of warm air pipe area are based on a velocity of 240 feet per minute at a temperature of 140 degrees Fahrenheit to first floor register, burning 6 pounds of coal per square foot of grate per hour. The actual consumption for the heating season would average from 2 to 2½ pounds. On this basis our ratings are minimum and when the heater is properly installed we can guarantee a temperature of 70 degrees in each room, outside temperature being zero.

We will be glad to furnish guarantee in writing through you to your customer, provided we have an opportunity to prepare the working layout and can thereby verify pipe sizes, register location, fresh air supply, and location of the heater. This service is given without any charge to you.

Sales Data

In pushing the sale of warm air heating systems you are called upon to defend the warm air system and convince people that the "Perfect" Warm Air Heaters have overcome disadvantages which generally condemn warm air heating systems.

We believe the following items will be your best arguments and should be carefully explained to the buyer:

Cheaper in Cost

The cost of the heater, pipes, registers and other materials and labor of installation, is far less than for any other heating system. This comparison is not based upon the pipeless heating system, but upon a warm air system having separate pipes and registers for each room.

Let us assume an average house, which would require a No. 224 "Perfect" Warm Air Heater, and we find that the cost of installing other systems compares as follows:

Steam 25 to 35 per cent more expensive
Vapor Vacuum Pressure 45 to 65 per cent more expensive
Hot water 65 to 85 per cent more expensive

Cheaper in Cost of Maintenance

There are fewer parts which may have to be replaced over a period of years and the life of the equipment is as long as that of any other system.

Less Coal

Tests have shown that warm air heating uses less coal because heat is more quickly transferred to air than to water. You know from experience it takes longer to raise the temperature of water sufficiently to circulate in a water system or to generate steam, than to create a very noticeable circulation of warm air. "Perfect" Warm Air Heaters burn less coal because of correct relation of grate area to heating surface.

Less Trouble When Family Is Away

There is no danger in allowing the fire of a warm air heater to die out. No parts can freeze or be otherwise damaged by cold weather.

More Comfort

The air in a room more nearly approaches the atmospheric conditions of a bright, sunny day, when heated by a warm air system, than can be obtained with any other heating system. It, therefore, is the most natural system for comfort and health.

Quicker Action

A bundle of newspapers or a few pieces of wood will quickly take the chill from the air in a house, and quick responsiveness is particularly appreciated in the early fall and late spring when a mild fire is sufficient.

This is equally important in the morning during severe weather when the fire has been banked for the night. A warm air heating system will almost instantaneously provide a noticeable degree of warmth in bed rooms and dining room. There is warmth so long as any fire exists in a warm air heater.

More Ventilation

The majority of warm air heating systems take fresh air from outdoors and the superior ventilation so obtained is self-evident.

State authorities insist upon a certain number of changes in the atmosphere of school rooms during the day, and this same protection should prevail in every home.

The only ventilation with other heating systems is from air seepage around the windows or the opening of windows and doors. This is a dangerous method of ventilation because the sudden current of cold air not only provides a very infrequent change of air, but brings the liability of colds, and diseases of various kinds.

People living in houses heated by warm air systems do not suffer from colds and other nasal conditions caused by a poor ventilation and lack of moisture in the air of the rooms in which they live.

More Humidity

A good warm air heater has a tank containing water which is evaporated and is carried to the individual rooms of the house. A certain degree of humidity is vitally essential and can be best supplied by a warm air heating system.

Not Dirty

"Perfect" Warm Air Heaters have but three joints through which dirt or gas could possibly escape. These are deep, cup joints which are well fitted and cemented. People who have "Perfect" Warm Air Heaters do not complain of dirt and gas.

Each Room Warm

Some people complain that certain rooms are cold when wind blows from that direction. These conditions are met by the proper location of heater, arrangement of fresh air supply and location of risers. Our heating layout is to overcome these conditions for you.

Construction of "Perfect" Warm Air Heaters

A visit to our factory would show the methods of manufacture which are accountable for the smooth, clean casting, capable workmanship, and quality which result in "Perfect" Warm Air Heaters.

We should like every dealer to have this intimate acquaintance with the way our product is manufactured for it is impossible to explain it all in writing.

We have never attempted to sell an inferior, cheap article, because for the person who actually owns and uses it over a period of time it represents not economy, but extravagance.

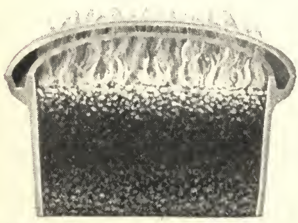
Our reputation for quality and duration in use have secured the confidence of the public, and our policy in that respect will continue unchanged.

In the construction of "Perfect" Warm Air Heaters the proportions of heating surface with grate area, air space surrounding the heater, and proportionate area of the important parts of the furnaces have been definitely determined.

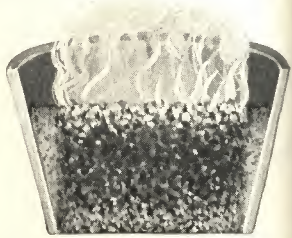
Tests which have been conducted for a period of years at the University of Illinois will prove these proportions and design to be superior.

There are certain valuable features of "Perfect" Warm Air Heaters which are incorporated in every one we manufacture, and they are closely identified with the name of Richardson & Boynton Company.

All "Perfect" Warm Air Heaters have straight-side firepots, and a correspondingly larger grate area. This means less attention to fire and less coal burned.



"Perfect" Straight Side Firepot No dead spaces and larger grate area



Sloping Side Firepot with same top diameter. Has smaller grate area and dead coal space

Grate Bar

"Perfect" Triangular Grate Bars, which shake in pairs. A slight motion cleans the fire. Has 65 per cent. free air space for proper ventilation. Three straight reinforcing edges extend the whole length of the bar to give it strength to prevent warping and breakage. These edges are clinker cutting. The shaking end of the bar is strengthened by a steel ring and the shaker fits into the end of the bar rather than over it.

Cup Joint

Cut-away section shows the full 1½-inch cup joint. There are but three such joints in "Perfect" Warm Air Heaters:

1. Between base and firepot.
2. Between firepot and body.
3. Between body and radiator.

There is ample space for expansion and for the generous cementing. This illustration clearly explains why "Perfect" Warm Air Heaters are proof against the escape of dust or gas.

These details will be brought out as we show and describe each type of heater, and this introduction will explain the reason for that repetition.

Dealers who feel the necessity for having interchangeable parts will find it met in the case of the 200 Series and pipeless heaters. This is a great convenience particularly in stocking heaters and in ordering repair parts.

2900 Series "Perfect" Positive Heaters for Anthracite

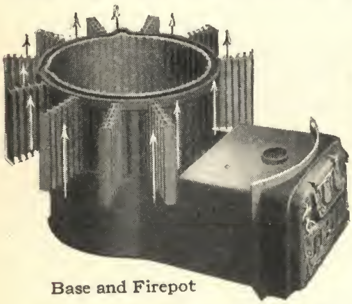
This type of heater will do more work with equal fuel consumption, or the same amount of work with less fuel than the average type with equal fire pot dimensions.

The flanges attached to the major parts of the heater not only add to the heating surface, but also prolong the life of the castings themselves.

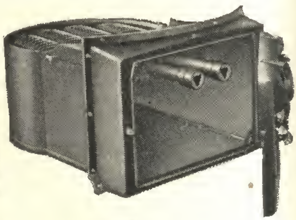
These heaters have from 42 to 53 square feet of air heating surface to 1 square foot of grate area. The average type of heater has from 15 to 23 square feet.

These heaters have a flue travel of from 8 to 13 feet which is in many cases double that of the average heater.

The great efficiency and low operating cost of these heaters is due to the following specifications:



Base and Firepot

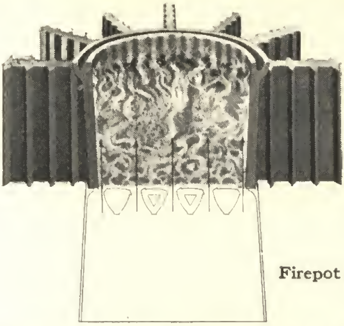


Base

Base: Straight side base, 14 inches in height, provides a substantial foundation for a heavy heater and allows the easy removal of ashes.

Grate Bar

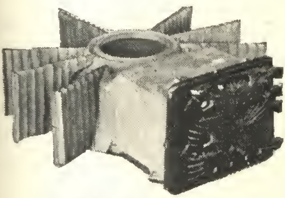
Grate Bars: Four triangular revolving grate bars which shake in pairs. They have 65 per cent free air space for proper ventilation of the fire. They are reinforced by three straight edges extending the total length of the bar and will not warp or break when left in the proper position. These reinforcing edges cut clinkers and the fire is readily cleaned by a slight movement of the shaker. The shaking end of the bar is strengthened by a steel ring and the shaker fits into the end of the bar rather than around it. Grates are easily released by removing yoke plate.



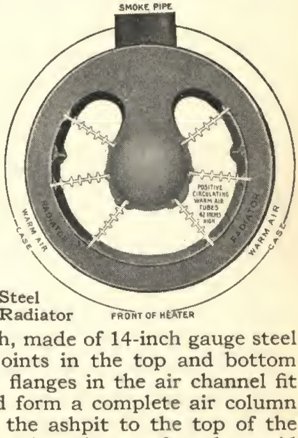
Firepot with Flanges

Fire Pot: Straight corrugated heavy fire pot 15 inches high which is self-cleaning. From 7 to 9 ribbed flanges extend from the fire pot and increase the heating surface four and one-half times. The straight side fire pot gives a full fire bed, and is not to be compared with fire pots of equal dimension at the top but with the sloping side. The grate area represents the fuel capacity and is the factor which, with heating surface, determines the amount of work a heater will do.

Body: Heavy high ribbed body of unusual strength with proper allowance for complete combustion of fuel. It has the double feed door for easy firing. From 5 to 7 flanges increase the heating surface and fit directly over the flanges of the fire pot. A full 1½ inch cup joint, when properly cemented, makes absolutely gas tight connection. Openings to the left of the feed door are for pipe connections when domestic water is heated by the same fire.



Body with Flanges



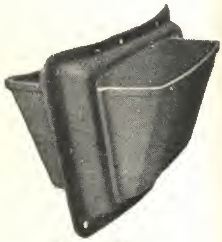
Steel Radiator

Steel Radiator: 17 inches high, made of 14-inch gauge steel and will last many years. Cup joints in the top and bottom plates are gas tight. From 4 to 6 flanges in the air channel fit directly over the body flanges and form a complete air column of peculiar shape extending from the ashpit to the top of the heater. These air columns drive the air with great force by rapid heating.

The flue travel of from 8 to 13 feet is divided by a horizontal diaphragm which forces the hot gases to pass twice through the radiator before escaping through the chimney. The full heating value of the coal is realized before reaching the chimney. The radiator is easily cleaned by entrance from the front. Flue passages are large for complete combustion to prevent back-firing or explosions.

Cast-Iron Radiator: This heavy one-piece radiator, 15 inches high, is difficult to make, but its value is exceptional. There is no possible gas leak and no possibility of breakage through unequal expansion. It is impossible to equal the advantages of this one-piece radiator by two-piece radiator construction. It has the internal construction whereby it has the unusually long flue travel and convenience in cleaning.

Cast-Iron Radiator



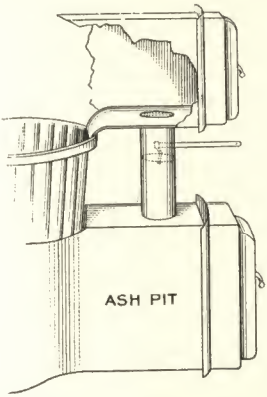
Water Pan

Water Pan: Located in the side of the casings where it properly humidifies the air. The air circulates more freely here than in the front of the heater, and carries more moisture to the rooms. An automatic valve, at slight additional cost, keeps water pan full at all times.

Panel Front: You will note that the panel front is no wider than necessary for the feed door opening. Experiments have shown that there is a heat loss unless the panel front is insulated. We invite your comparison of the width of this panel front with others as an item of fuel economy for the consumer. It is large enough and heavy enough to do the work required.

Casings: 26-inch gauge of the best quality galvanized iron is used for the casings. They are lined with best quality bright corrugated tin for heat deflection. The air chamber between heater and cases is correctly proportioned and the diameter of the cases determined on that basis.

Dust Pipe Connecting Base and Body



Dust damper and pipe connecting the base and body allows the escape of dust when the grates are shaken. It is operated by a damper handle which extends through the panel front just below the feed door. This attachment is of peculiar interest to the house owner because it does away with the complaint of dust from ashes coming into the house which is so frequently heard.

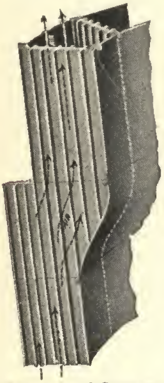
Casing Rings: Cast iron sectional rings are sturdy support for cases and easy to erect.

Regular Equipment includes No. 2 damper, poker and shaker. Perforated damper included for soft coal.

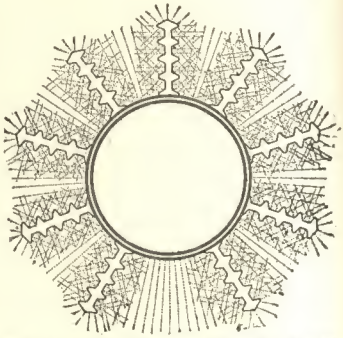
These heaters can be equipped to burn gas, soft coal and wood. They are adaptable to burn oil.

The capacity in square inches of warm air pipe area is carefully determined and guaranteed by us. It is conservative, so that the heater will do the necessary work in extremely cold weather without more frequent firing. The average fuel consumption throughout the heating season is 2½ pounds of coal per square foot of grate per hour.

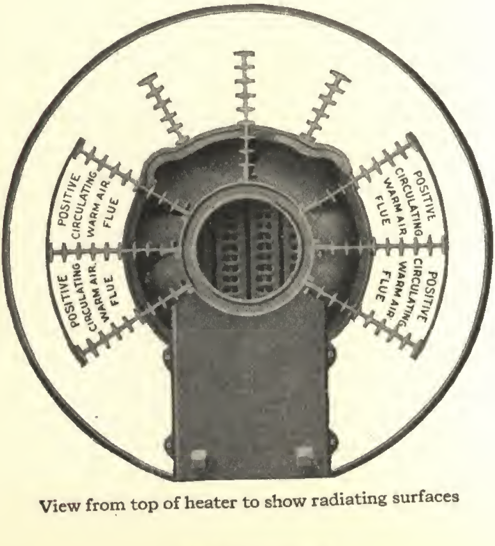
From your knowledge and practical use we ask you to compare all of the above features in detail.



Flanges of firepot, body and radiator form these air tubes 42″ high

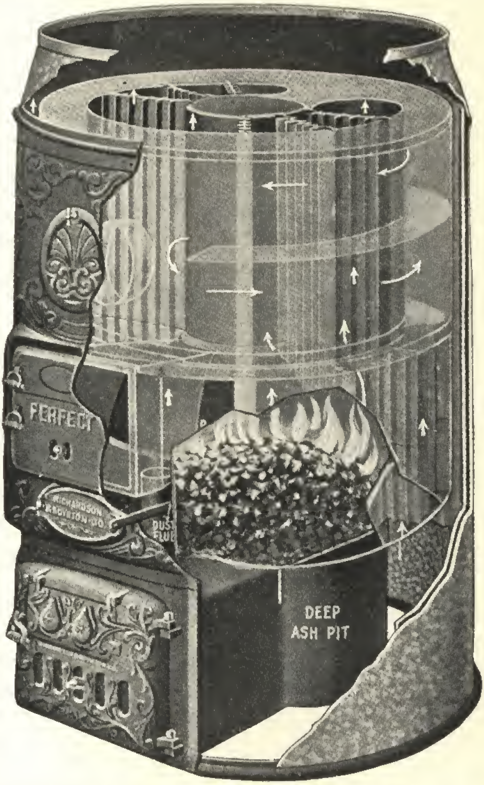


Radiation diagram shows that air is thoroughly heated by enlarged surfaces



View from top of heater to show radiating surfaces

2900 Series "Perfect" Positive Heaters for Anthracite



With Steel Radiator and Large Double Doors

No.	Diam. Fire Pot In.	Grate Area In.	Diam. Radiator In.	Diam. Cases In.	Hght. of Panel Front In.	Size Smoke Pipe In.	Pipe Capacity Sq. In.	Shipping Weight Less Cases Lbs.
2901	21	283.53	35½	46¾	55¼	8	484	1245
2902	24	346.36	40	52¾	56⅛	9	626	1475
2904	26	415.48	45½	58	57½	9	812	1710
2906	29	572.56	49½	61⅝	59¾	10	1024	2020
2908	33	804.25	56½	68¾	62	10	1369	2640

Note—The above ratings are based on a sufficient supply of air to the heater. For indoor air supply, figure 100 per cent, and for outside air supply, 80 per cent of the total capacity of the warm air pipes attached to the heater.

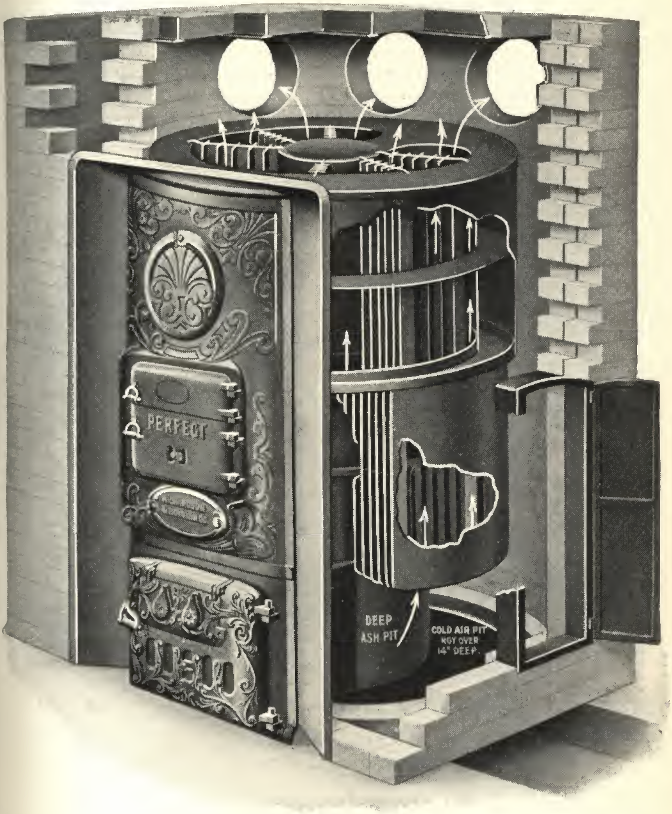
2900 Series "Perfect" Positive Heaters for Anthracite

With Cast Iron Radiator and Large Double Doors

No.	Diam. Fire Pot In.	Grate Area In.	Diam. Radiator In.	Diam. Cases In.	Hght. of Panel Front In.	Size Smoke Pipe In.	Pipe Capacity Sq. In.	Shipping Weight Less Cases Lbs.
2901	21	283.53	35	46¾	55¼	8	484	1365
2902	24	346.36	39	52¾	56⅛	9	626	1625
2904	26	415.48	43½	58	57½	9	812	1955
2906	29	572.56	48	61⅝	59¾	10	1024	2240
2908	33	804.25	54	68¾	62	10	1369	2865

Note—The above ratings are based on a sufficient supply of air to the heater. For indoor air supply, figure 100 per cent, and for outside air supply, 80 per cent of the total capacity of the warm air pipes attached to the heater.

"Perfect" Positive Heater in Brickset Form



	2901	2902	2904	2906	2908
Height of front, in.	60½	61⅝	63¼	65	67⅝
Width of front, in.	33⅝	35$\frac{1}{16}$	36¾	36	43¾
Height to bottom of smoke collar, steel radiator, in.	37½	37⅞	39⅜	41½	43
Cast radiator, in.	43	43¼	45½	46⅝	48⅜
Height to top of smoke collar, steel radiator, in.	44½	44⅝	46$\frac{3}{16}$	48¾	49¾
Cast radiator, in.	51	52¼	54½	56⅝	58⅜
Minimum inner diameter of Brickwork, in.	40	47	52	57	63

Covering bars, trench plates, or manhole door and frame must be specified extra. Recess front panels only are regular equipment.

2930 Series "Perfect" Positive Heaters for Soft Coal

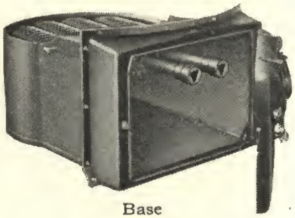
This type of heater will do more work with equal fuel consumption or the same amount of work with less fuel than the average type with equal fire pot dimensions.

The flanges attached to the major parts of the heater not only add to the heating surface, but also prolong the life of the castings themselves.

These heaters have from 42 to 53 square feet of air heating surface to 1 square foot of grate area. The average type of heater has from 15 to 23 square feet.

These heaters have a flue travel of from 8 to 13 feet which is in many cases double that of the average heater.

The great efficiency and low operating cost of these heaters is due to the following specifications:



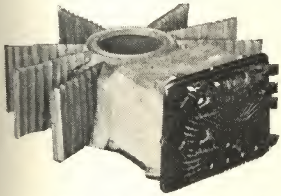
Base

Base: Straight side base, 14 inches in height, provides a substantial foundation for a heavy heater and allows the easy removal of ashes.

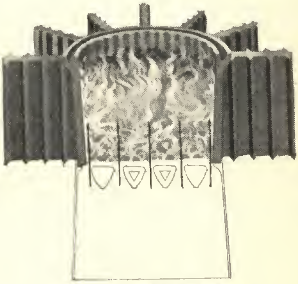
Grate Bar

Grate Bars: Four triangular revolving grate bars which shake in pairs. They have 65 per cent free air space for proper ventilation of the fire. They are reinforced by three straight edges extending the total length of the bar and will not warp or break when left in the proper position. These reinforcing edges cut clinkers and the fire is readily cleaned by a slight movement of the shaker. The shaking end of the bar is strengthened by a steel ring and the shaker fits into the end of the bar rather than around it. Grates are easily released by removing yoke plate.

Fire Pot: Straight corrugated heavy fire pot 15 inches high. From 7 to 9 ribbed flanges extend from the fire pot and increase the heating surface four and one-half times. The straight side fire pot gives a full fire bed, and is not to be compared with fire pots of equal dimension at the top but with the sloping side. The grate area represents the fuel capacity and is the factor which with heating surface determines the amount of work a heater will do.

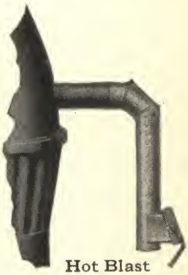


Body with Flanges



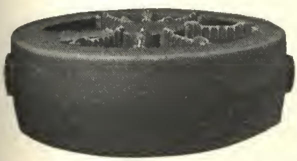
Firepot with Flanges

Body: Heavy high ribbed body of unusual strength with proper allowance for complete combustion of fuel. It has the double feed door for easy firing. From 5 to 7 flanges increase the heating surface and fit directly over the flanges of the fire pot. A full $1\frac{1}{2}$-inch cup joint, when properly cemented, makes absolutely gas tight connection. Openings to the left of the feed door are for pipe connections when domestic water is heated by the same fire.



Hot Blast

You will note the hot blast at the rear of the body to admit a supply of preheated air. This air supply increases the efficiency and decreases the fuel consumption by completing the combustion of gases.



Cast-Iron Radiator

Cast-Iron Radiator: Heavy, one-piece radiator is 15 inches high. There is no possible gas leak and no possibility of breakage through unequal expansion. It is far superior to the average two-piece radiator. A vertical division plate forces the heated gases to pass completely around through the radiator before escaping to the chimney. Flue passages are large for complete combustion to prevent back-firing or explosions.

Panel Front: You will note that the panel front is no wider than necessary for the feed door opening. Experiments have shown that there is a heat loss unless the panel front is insulated. We invite your comparison of the width of this panel front with others as an item of fuel economy for the consumer. It is large enough and heavy enough to do the work required.

Water Pan

Water Pan: Located in the side of the casings, where it properly humidifies the air. The air circulates more freely here than in the front of the heater, and carries more moisture to the rooms. An automatic valve, at slight additional cost, keeps water pan full at all times.

Casings: 26-inch gauge of the best quality galvanized iron is used for the casings. They are lined with best quality bright corrugated tin for heat deflection. The air chamber between heater and cases is correctly proportioned and the diameter of the cases determined on that basis.

Casing Rings: Cast iron sectional rings are sturdy supports for cases, and easy to erect.

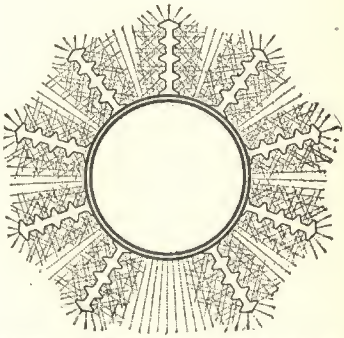
Regular equipment includes cast iron combination smoke tee with damper, perforated damper, poker and shaker.

These heaters can be equipped to burn gas and wood. They are adaptable to burn oil.

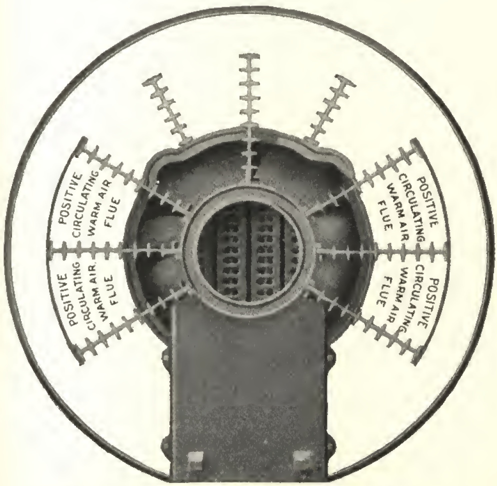
The capacity in square inches of warm air pipe area is carefully determined and guaranteed by us. It is conservative so that the heater will do the necessary work in extremely cold weather without more frequent fuel attention. The average fuel consumption throughout the heating season is two pounds of coal per square foot of grate per hour.

From your knowledge and practical use we ask you to compare all of the above features in detail.

Flanges of firepot, body and radiator form these air tubes 42″ high



Radiation diagram shows that air is thoroughly heated by enlarged surfaces



View from top of heater to show radiating surfaces

2930 Series "Perfect" Positive Heaters for Soft Coal

With Cast-Iron Radiator and Hot Blast
For Hard or Soft Coal or Wood Fuel

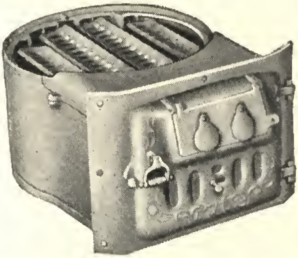
No.	Diam. Fire Pot In.	Grate Area In.	Diam. Radiator In.	Diam. Cases In.	Hght. of Panel Front In.	Size Smoke Pipe In.	Pipe Capacity Sq. In.	Shipping Weight Less Cases Lbs.
2931	21	283.53	35	46¾	56¼	8	484	1365
2932	24	346.36	39	52¾	56⅛	9	626	1625
2934	26	415.48	43½	58	57½	9	812	1955
2936	29	572.56	48	61⅝	59¾	10	1024	2240
2938	33	804.25	54	68¾	62	10	1369	2865

Note—The above ratings are based on a sufficient supply of air to the heater. For indoor air supply, figure 100 per cent, and for outside air supply, 80 per cent of the total capacity of the warm air pipes attached to the heater.

200 Series "Perfect" Heaters with Steel or Cast-Iron Radiators

This type of heater is made to meet the demand of operation work and for other buildings where a lower priced heater is necessary. A comparison of the following specifications with the average low priced heater on the market will readily explain its superiority.

These heaters have from 11 to 23 square feet of air heating surface to 1 square foot of grate area. The capacity in square inches of warm air pipe area is correctly determined and guaranteed by us. It is conservatively rated so that the heater will do the necessary work in extremely cold weather without more frequent fuel attention. The average fuel consumption through the heating season is 2½ pounds of coal per square foot of grate per hour.



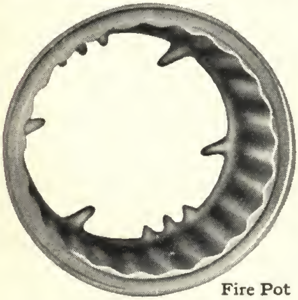
Base

Base: 12-inch straight side base shipped as a complete unit. It is heavy in construction and provides a substantial support for the heater. The height and design allow the easy removal of ashes and proper draft for the fire.

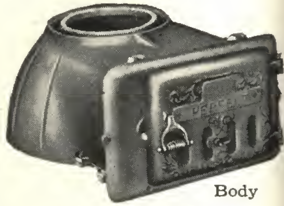
Grate Bar

Grate Bars: Four triangular revolving grate bars which shake in pairs. They have 65 per cent free air space for proper ventilation of the fire. They are reinforced by three straight edges extending the total length of the bar, and will not warp or break when left in the proper position. These reinforced edges cut clinkers and the fire is readily cleaned by a slight movement of the shaker. The shaking end of the bar is strengthened by a steel ring and the shaker fits into the end of the bar rather than around it. Grates are easily released by removing the yoke plate.

Fire Pot: Straight corrugated heavy fire pot, 12 inches high, is self-cleaning. The straight side fire pot allows a full fire bed and is not to be compared with fire pots of equal dimension at the top, but having the sloping side. The grate area represents the fuel capacity and is the factor, which with heating surface, determines the amount of work the heater will do. A full cup joint assures gas-tight connection with the base and body.

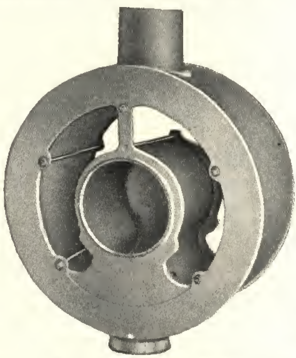


Fire Pot



Body

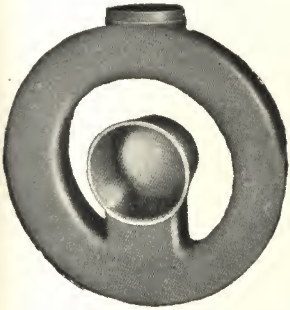
Body: Heavy ribbed body with proper allowance for complete combustion of fuel. It has a large single door for easy firing. Openings to the left of the fire door are for pipe connection when domestic water is heated by the same fire. A full cup joint assures gas-tight connection with the radiator.



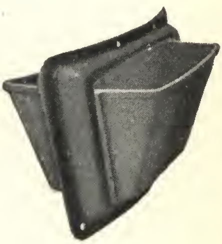
Steel Radiator

Steel Radiator: Radiator, 15 inches high, is made of 18-gauge steel and will last many years. Cup joints in the top and bottom plates are gas tight. The fuel travel is greater than the average for extracting the full heating value from the coal. This massive heating surface, compared with the average height radiator, gives a final impetus to the warm air before passage from the pipes to the rooms of the house. The cleanout opening at the front of the radiator is for the frequent cleaning of the flues. Flue spaces are large to prevent back-firing or explosions.

Cast-Iron Radiator: Heavy one-piecer, radiato 12 inches high, is recommended for bituminous or wood fuel. We emphasize the fact that it is in one piece and therefore far superior to the usual two-piece cast-iron radiators on the market. Because of its construction there is equal expansion throughout and no possibility of breakage in use. It has the same internal construction as the steel radiator to provide a long flue travel. Flue spaces are large to prevent back-firing or explosions.



Cast-Iron Radiator



Water Pan

Water Pan: You will note that we locate the water pan in the casing on the side of the heater. This location is proper to provide humidity in the heated air. Most water pans are in the panel front where it does not come in contact with sufficient air to provide proper degree of humidity. An automatic valve can be furnished at a slight additional cost to keep the water pan filled at all times

Panel Front: You will note that the panel front is no wider than necessary for the feed door opening. Experiments have shown that there is a heat loss unless the panel front is insulated. We invite your comparison of the width of this panel front with others as an item of fuel economy for the consumer. It is large enough and heavy enough to do the work required.

Casings: 26-inch gauge of the best quality galvanized iron is used for the casings. They are properly supported by three cast-iron sectional rings. The air chamber between heater and casings is correctly proportioned and the diameter of the casings determined on that basis.

Regular equipment includes damper No. 8, poker and shaker. Perforated damper included for soft coal.

These heaters can be equipped to burn soft coal, gas and wood. They are adaptable to burn oil.

From your knowledge and practical use we ask you to compare all of the above features in detail.

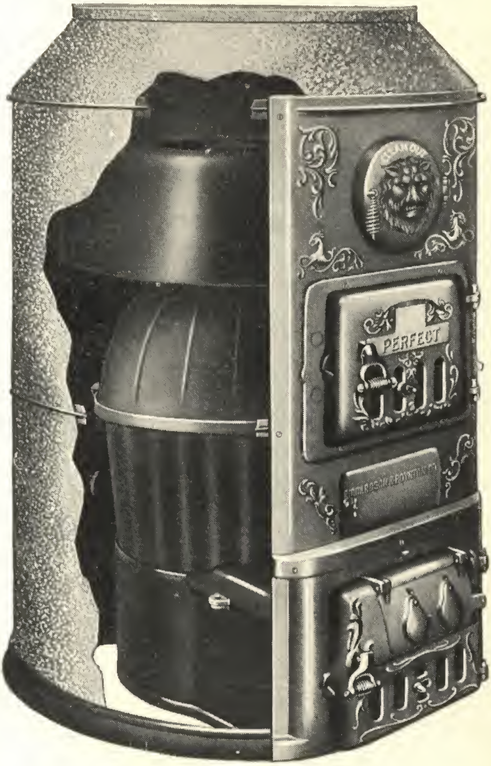
200 Series "Perfect" Heater

With Steel Radiator

No.	Diam. Fire Pot In.	Grate Area In.	Diam. Radi-ator In.	Diam. Cases In.	Hght. of Panel Front In.	Size Smoke Pipe In.	Pipe Capac-ity Sq. In.	Ship-ping Weight Less Cases Lbs.
217	17	113.10	22½	32	48⅝	7	240	575
219	19	201.06	26	36	48⅞	8	300	670
222	22	283.53	29¾	40	49¼	8	400	805
224	24	346.36	33½	44	50½	8	525	925
226	26	415.48	37	50	50⅞	8	625	1065
229E	29	572.56	42	53½	55	8	800	1360

Note—The above ratings are based on a sufficient supply of air to the heater. For indoor air supply, figure 100 per cent, and for outside air supply, 80 per cent of the total capacity of the warm air pipes attached to the heater.

200 Series "Perfect" Heater



With Cast-Iron Radiator

No.	Diam. Fire Pot In.	Grate Area In.	Diam. Radiator In.	Diam. Cases In.	Height of Panel Front In.	Size Smoke Pipe In.	Pipe Capacity Sq. In.	Shipping Weight Less Cases Lbs.
219	19	201.06	28	36	$48\frac{7}{8}$	8	300	745
222	22	283.53	$30\frac{1}{2}$	40	$49\frac{1}{4}$	8	400	865
224	24	346.36	$33\frac{1}{2}$	44	$50\frac{1}{2}$	8	525	1015
226	26	415.48	$37\frac{1}{2}$	50	$50\frac{7}{8}$	8	625	1160
229E	29	572.56	40	$53\frac{1}{2}$	55	9	800	1540

Note—The above ratings are based on a sufficient supply of air to the heater. For indoor air supply, figure 100 per cent, and for outside air supply, 80 per cent of the total capacity of the warm air pipes attached to the heater.

Brickset Measurements of 200 Series "Perfect" Heaters

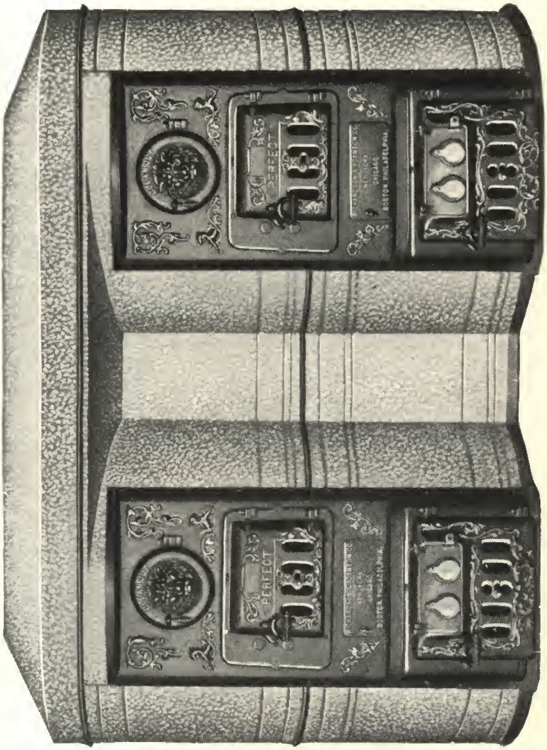
	219	222	224	226	229E
Height of front, in.	54¾	54¾	56¾	57	60½
Width of front, in.	31	33¼	35	36	34½
Height to bottom of smoke collar, steel radiator, in.	35½	38¼	38½	40⅜	41⅜
Height to bottom of smoke collar, cast radiator, in.	34⅞	37¼	37½	39½	40¼
Height to top of smoke collar, steel radiator, in	43⅜	46⅛	46⅜	48¼	49¼
Height to top of smoke collar, cast radiator, in.	42⅞	45¼	45½	47½	49¼
Minimum inner diameter of brick-work, in.	32	36	40	44	48

Covering bars, trench plates, or manhole door and frame must be specified, extra. Recess front panels only are regular equipment.

Larger Feed Door Openings of 200 Series "Perfect" Heaters

When no openings are necessary for water coil, a special feed door frame allows larger feed opening.

No.	Opening with Water Coil	Opening Without Water Coil
217	11 9/16 x 11	14 x 11
219	11 7/16 x 8⅞	13⅞ x 8⅞
222	12⅞ x 10	15⅛ x 10
224	12⅞ x 10	15⅛ x 10
226	12⅞ x 10	15⅛ x 10
229E	12¾ x 7⅜	14¾ x 7⅜



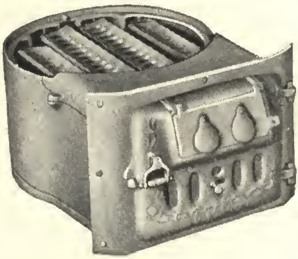
Two "Perfect" Heaters in battery form casings for large houses

"Perfect" Pipeless Heating System

The 200 Series "Perfect" Heater is used in the pipeless heating system. Extensions to the panel front, larger casing rings, and the outer bonnets and cases complete the change. Because of over-size air chambers, this pipeless heater has proved most satisfactory and economical.

The capacities in cubic feet are carefully determined and guaranteed by us. They are conservative so that the heater will do the necessary work in extremely cold weather without more frequent fuel attention.

We itemize specifications for your comparison and information.

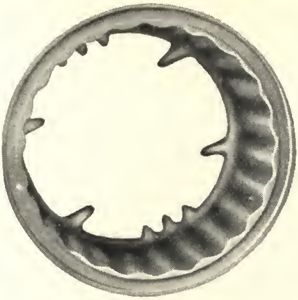


Base

Base: 12-inch straight side base shipped as a complete unit. It is heavy in construction and provides a substantial support for the heater. The height and design allow the easy removal of ashes and proper draft for the fire.

Grate Bar

Grate Bars: Four triangular revolving grate bars which shake in pairs. They have 65 per cent free air space for proper ventilation of the fire. They are reinforced by three straight edges extending the total length of the bar, and will not warp or break when left in the proper position. These reinforced edges cut clinkers and the fire is readily cleaned by a slight movement of the shaker. The shaking end of the bar is strengthened by a steel ring and the shaker fits into the end of the bar rather than around it. Grates are easily released by removing the yoke plate.

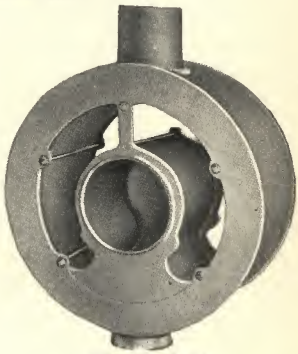


Fire Pot

Fire Pot: A straight corrugated heavy fire pot, 12 inches high. The straight side fire pot allows a full fire bed and is not to be compared with fire pots of equal dimension at the top, but having the sloping side. The grate bar represents the fuel capacity and is the factor, which with heating surface, determines the amount of work the heater will do. A full cup joint assures gas-tight connection with the base and body.

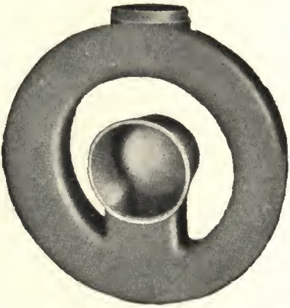
Body: A heavy ribbed body with proper allowance for complete combustion of fuel. It has a large single door for easy firing. Openings to the left of the fire door are for pipe connection when domestic water is heated by the same coil. A full cup joint assures gas-tight connection with the radiator.

Body



Steel Radiator

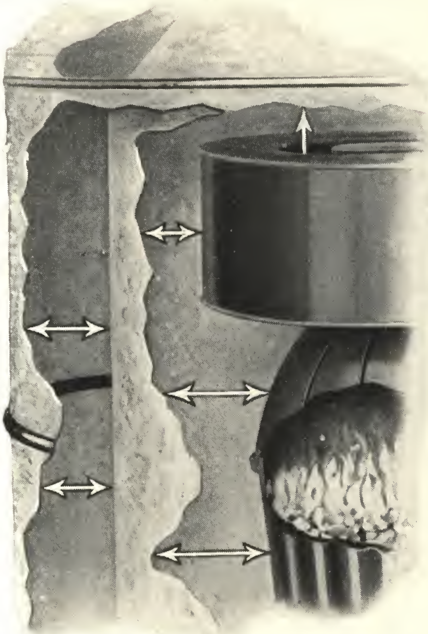
Steel Radiator: This radiator, 15 inches high, is made of 18-gauge steel and will last many years. Cup joints in the top and bottom plates are gas tight. The fuel travel is greater than the average for extracting the full heating value from the coal. This massive heating surface compared with the average height radiator, gives a final impetus of the warm air before passage from the pipes to the rooms of the house. The cleanout opening at the front of the radiator is for the frequent cleaning of the flues.



Cast-Iron Radiator

Cast-Iron Radiator: This heavy one-piece radiator, 12 inches high, is recommended for bituminous or wood fuel. We emphasize the fact that it is in one piece and therefore is far superior to the usual two-piece cast-iron radiators on the market. Because of its construction there is equal expansion throughout and no possibility of breakage in use. It has the same internal construction as the steel radiator to provide a long flue travel.

Panel Front: You will note that the panel front is no wider than necessary for the feed door openings. Experiments have shown that there is a heat loss unless the panel front is insulated. We invite your comparison of the width of this panel front with others as a matter of fuel economy for the consumer. It is large enough and heavy enough to do the work required.



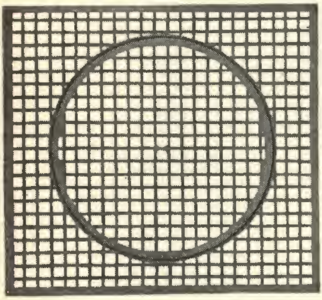
The "Perfect"

The Pipeless Heater with Extra-size Air Chambers

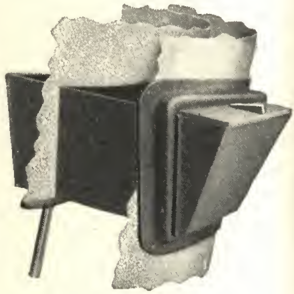
Note the great amount of space for air circulation
It is this liberality of air space that makes the "Perfect" the greatest Pipeless Heater

Casings: 26-inch gauge of the best quality galvanized iron is used for the casings. They are supported by cast-iron rings and the diameter between the inner and outer casings varies from 11 to 13 inches according to size. The average pipeless heater has a space of only 4 inches between inner and outer casings which is not adequate for a steady circulation of thoroughly heated air. The insulation or lining of the inner casing of our heater is not necessary because of its over-sized chamber for the return of cold air. Furthermore this over-sized chamber assures a cool cellar for the storage of vegetables, etc. The same proportion of space for the return of cold air is maintained throughout the heater. The oversized air chamber prevents cold air drafts along the floor which are caused by the rapid circulation through small casings.

Register: This cast-iron duplex grating is either black japan, oxidized, nickel or brushed brass finish. The area for the cold air is equal to the area of the warm air section and they are in proportion to the air chambers throughout the heater. This register is very strong in construction and neat in appearance. It is not larger than necessary for the capacity of the heater.



Register



Water Pan

Water Pan: The water pan is located in the casings at the side of the heater and extends through both casings into the warm air chamber. This location is preferable to give the proper amount of moisture to the warm air. It comes in contact with more air to be humidified here than if located in the front of the heater. We can furnish at a slight additional cost an automatic valve to keep this pan filled at all times.

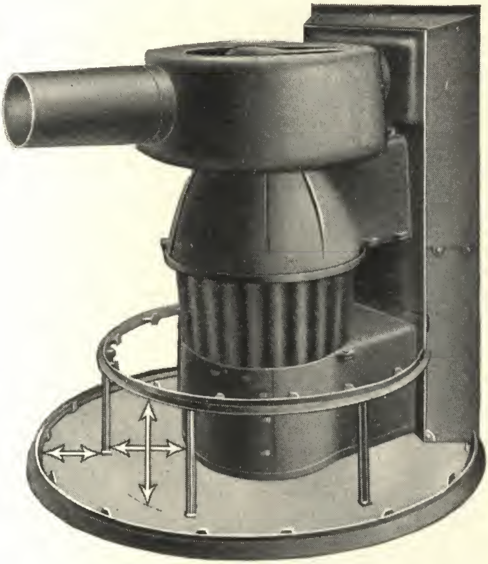
Clean Out Door

Clean Out Door: Located at bottom of outer casing. Permits easy cleaning of dust at bottom of heater when necessary.

These heaters can be equipped to burn soft coal, gas and wood. They are adaptable to burn oil.

From your knowledge and practical use we ask you to compare all of the above features in detail.

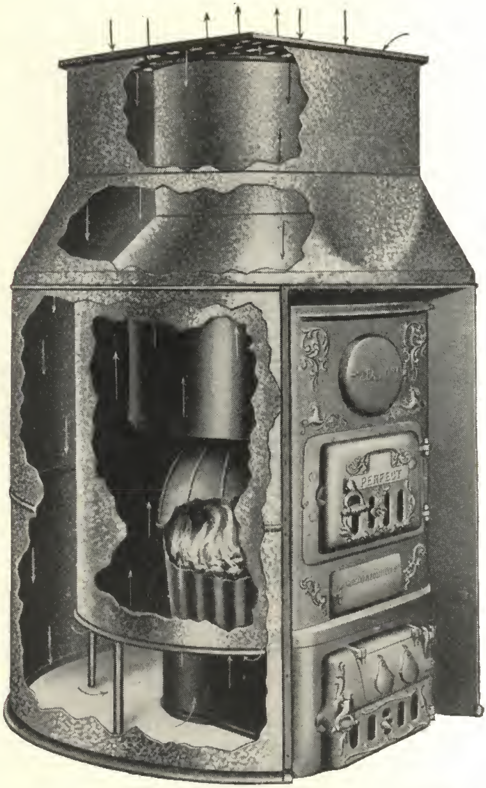
The Heater With Casings Removed



In another way this illustrates the great air room of the "Perfect" Pipeless Heater. The walls or casings of the heater rest on the two large circular rings. The arrows indicate the great width of the air chambers thus formed. The cold air comes down through the outer chamber, and turns up into the inside chamber next to the heater. Note how great the air space is in proportion to the size of the heater. Because it has more air, the "Perfect" burns less coal. And air is cheaper than coal!

Regular equipment includes damper No. 8, poker and shaker. Perforated damper included for soft coal. Black japanned register is regularly furnished and extra charge made for oxidized or nickel register.

"Perfect" Pipeless Heater



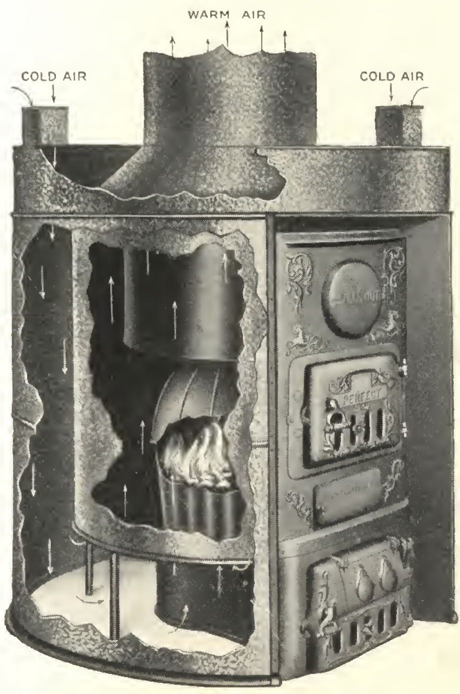
	117	119	122	124	126
Diam. of Fire Pot, in....	17	19	22	24	26
Grate Area, in........	113.10	201.06	283.53	346.36	415.48
Size of Feed Door Opening with Pipe Holes, in.	11x11 9/16	8 7/8x11 7/16	10x12 7/8	10x12 7/8	10x12 7/8
Size of Feed Door Opening less Pipe Holes, in.	11x14	8 7/8x13 7/8	10x15 1/8	10x15 1/8	10x15 1/8
Size of Smoke Pipe, in..	7	8	8	8	8
Diam. Inner Casing, in.	32	36	40	44	50
Diam. Outer Casing, in.	43	47	53	58	63
Size of Register, in......	22x24	24x27	30x30	30x36	36x36
Size Warm-air Pipe, in.	16	18	22	24	28
Shipping Weight Complete, lbs. steel.......	913	1043	1249	1376	1590
Capacities, cu. ft.......	7–9000	9–13,000	13–18,000	18–28,000	28–40,000
Height from Floor to Top of Bonnet, in.....	66	68	70	71	72
To Top of Register, in.	90	90	90	90	90

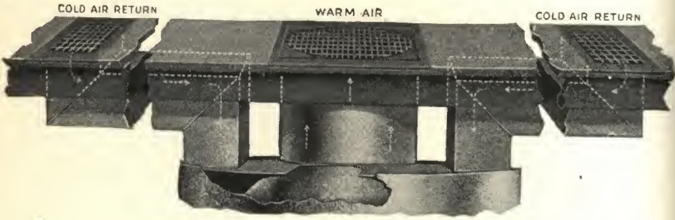
Minimum height of cellar required, 6 1/2 feet

"Perfect" Recirculating Air System

This system is an adaptation of the original pipeless heating system. It is recommended in instances where there is not a free circulation of air throughout the house.

The heating of a distant room or a room which has coldest exposures is accomplished by taking a cold air return line from those parts of the house. This cold air return has a tendency to draw the warm air into that part of the house. It absolutely overcomes the cold drafts along the floor and opens up an enlarged field for pipeless heating systems.





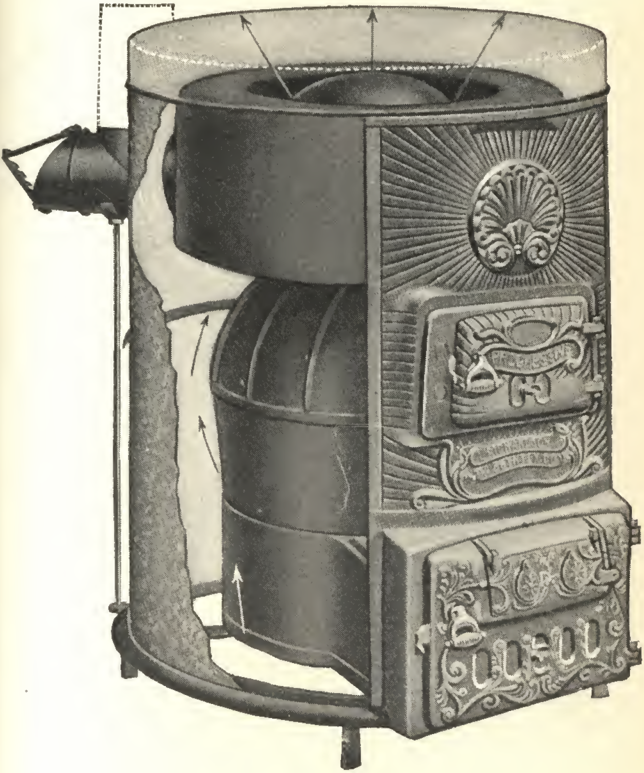
	319	322	324	326
Diameter of firepot, in..	19	22	24	26
Grate area, in.	201.06	283.53	346.36	415.48
Size of feed door opening with pipe holes, in.	9x10¾	10x12½	10x12½	10x12½
Size of feed door opening less pipe holes, in..	9x13¼	10x14¼	10x14½	10x14½
Size of smoke pipe, in..	8	8	8	8
Diameter of inner casing, in..	36	40	44	50
Diameter of outer casing, in..	47	53	58	63
Size of warm air register, in.	21x21	25x25	27x27	31x31
Size of warm air pipe, in.	18	22	24	28
Size of cold air grilles, in.	10x24	12x30	14x30	20x30
Size of cold air connections on bonnet, in.	10x14	10x22	10x24	12x30
Shipping weight complete, lbs.	1043	1249	1376	1589
With cast radiators, lbs.	1143	1293	1436	1678
Capacities, cu. ft.	9-13000	13-18000	18-28000	28-40000
Height from floor to top of bonnet, in.	63½	64½	65¾	66
To top of warm air pipe, in.	90	90	90	90

If the building is spread out (that is, if the first floor has wing extensions, or if there are rooms on the second floor not directly over those on the first floor), use a heater "one size larger" for your building. That is, if your building has a total cubical content of 13,750 feet, and is a spread-out building, you should have the No. 322 Heater—which is one size larger than you would need for the same building if it were compact.

It is easy to decide size of Heater

"Perfect" Pipeless Heaters are made in five sizes. Multiply the length by the width by the height of each room and each hall, and add the results. This will give you the total cubical content of the building. Refer to the table and choose the heater having the capacity nearest above the total cubical content of your building.

"Progressive" School Room Heater



With Cast-Iron Radiator

No.	Diam. Fire Pot In.	Diam Radiator In.	Diam. Cases In.	Height Cases In.	Smoke Pipe In.	Capacity Cu. Ft.	Shipping Weight Complete Lbs.
1132	18½	28	32	55	7	12,000	850
1136	21	30½	36	56	8	18,000	1025
1140	24	33½	40	57	8	28,000	1175
1144	26	37½	44	58	8	40,000	1375
1150	29	40	50	61	9	55,000	1450

Mechanical Circulator for Warm Air Heaters

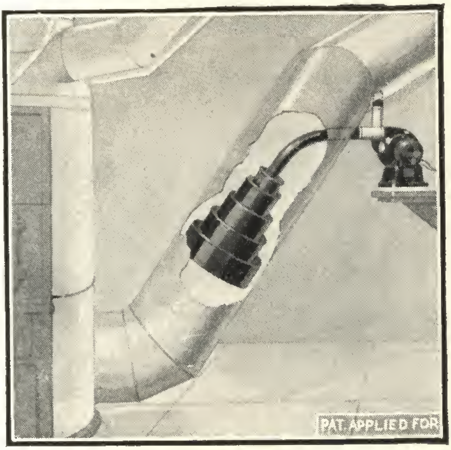
By applying some mechanical means to force the air through the system of ducts of a Warm Air System in a more positive manner than is possible by depending upon gravity of air at different temperatures, many of the uncertain factors in furnace installations can be eliminated and the initial cost and the operating expense reduced.

The main objection to a fan or blower to move the air has been the first cost and the operating expense. The circulator is a device that will not obstruct the flow of air when it is not in operation; is inexpensive and easy to install; it requires nothing more than the pressing of a push-button to start or stop it; and it has sufficient capacity to deliver the required volume of air against the normal resistance of the average heating plant, so as to heat all the rooms to an even and comfortable temperature in any weather.

The great saving of fuel is the ability to circulate as much or more air at a low temperature as the maximum volume obtainable by gravity circulation at very high temperature.

The circulator is not a remedy for improperly designed or inadequate heater installations. It will make a weak circulation stronger, it will circulate ample heat at a very much lower temperature; it will heat the house in from one-half to one-quarter of the time ordinarily required; and it will do all this and pay for itself from the saving in fuel. When not in operation, due to the design of the eductor rings, the "Sirocco" Circulator offers no resistance to the natural gravity circulation of air, which is established after the heater fire is brought up to a point where it will maintain proper temperature in the crown of the heater.

The No. 28 "Sirocco" Circulator, which is suitable for the average small house, uses 100 watts. At a ten-cent rate this is an operating cost of one cent per hour. The cost is reduced, of course, by the fact that it is in use only short periods each day.



"Sirocco" Size	No. 24	No. 28	No. 36
For any Heater having leader pipe area up to	360 sq. in.	361 to 600 sq. in.	601 to 1150 sq. in.

Special sizes for larger heaters.

The area of the return air pipe must be at least 70 per cent of total area of warm air pipes.

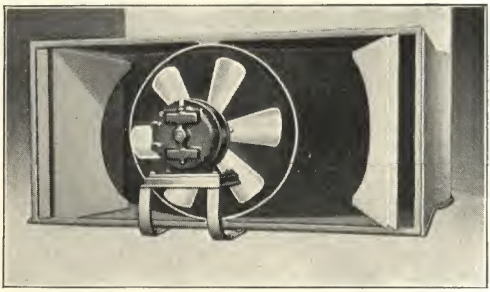
Two to three hours are required to install a Circulator on the average job. See instruction card accompanying unit.

Note: All units are equipped with 10 feet of standard lamp cord with plug attached, making unit complete for connection of ordinary lamp socket.

In ordering, please specify current required for motor, i. e., 110-volt alternating current, single phase 60 cycle, or 110-volt direct current, as the case may be. Motors for other currents can be furnished if required.

The "Automatic Furnace Fan" can be shut off after circulation has been established, and the Louvre dampers, or shutters, at each side of the fan will automatically drop open. They allow the full normal flow of air by gravity. These dampers automatically close when the fan is started and prevent escape of forced air. The air supply cannot "back up" with this equipment, but must pass around the heater and up to leader pipes.

The whole unit fits inside the cold air boot as shown.

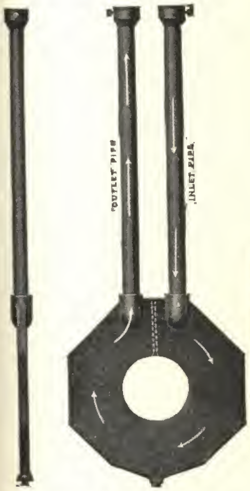


	No. 600	No. 800	No. 1000
Capacity, cu. ft. min.	1000	1400	2000
Size of outer frame, in.	16 x 33	16 x 38	18 x 42
Free area, sq. in.	475	547	680
Current used per hour, watts	40	60	92

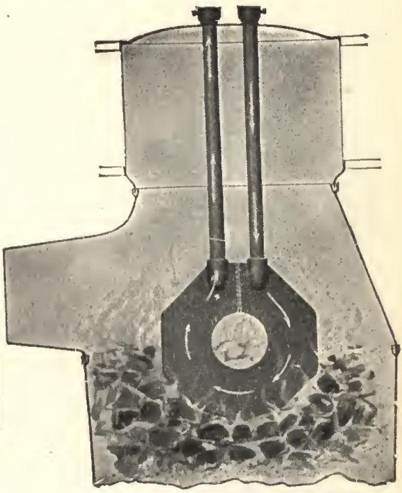
Richardson Water Heating Disks

For Hot Water Radiation in Combination with Warm Air Heating

These are powerful attachments for heating radiation in combination with warm air heating. Careful estimates are necessary to provide large enough heater for this work. One foot of hot water radiation should be measured as one inch of warm air pipe area. The total radiation considered as extra warm air pipe area will determine the size of heater. They are placed inside the pots with pipes up through the center of radiator, thus hanging in position, and will do the work easily and effectively. They circulate water even with a low fire.



Front View   Side View



Side View as Placed In Heater

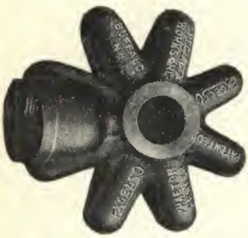
Sizes Inches	Radiation Rating Sq. Ft.	Should be Placed in Pots of Inches Diameter
12	150	24
14	200	26
16	275	29
18	350	33

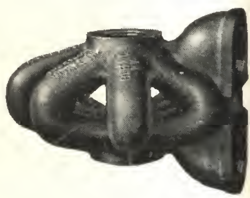
The heating power is largely dependent upon the size of the firepot; the same disk inside a larger body of coal will heat more than if put in a smaller body of coal.

	12-inch	14-inch	16-inch	18-inch
Outside width, in.	11½	13½	15¼	17¼
Outside height, in.	12¾	14⅝	16¾	18¾
Tappings, in.	1½	1½	1½	1½
C. to C. of tapping, in.	5⅛	5⅛	5⅛	5⅛
Shipping, weight, lbs.	55	59	68	75
Length of pipes, in.	42½ 39½	40½ 37½	38½ 35½	36½ 33½

Each disk has ½-inch plug for drain, and each pipe is held at radiator casting by 3-inch collar. Piping is extra heavy.

Phaeton Auxiliary Water Heaters



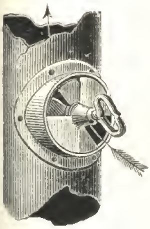


These auxiliary heaters are for domestic hot water supply, auxiliary radiators or both. Finished in cast-iron or brass. They are placed in the heater above and out of the way of the fire. Side, top, and bottom tappings.

Dimensions and Capacities

Diameter, in.	6	8	10	12	15	18
Height, in.	3½	4½	5¼	6	7	8
Tappings, in.	1	1	1½	2	2½	3
C. to C. of Side Outlets, in.	2½	2½	3	3½	4½	5½
Capacity, gals.	30	45	80	100	150	250
Sq. ft. direct water radiation	40	75	100	150	250	400
Shipping weight, lbs.	6	11	18	30	60	85

Dampers

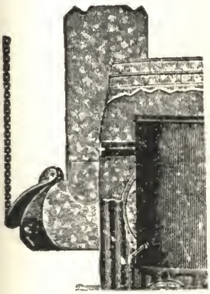


Style No. 1
Open

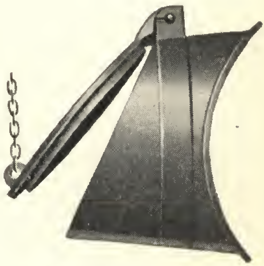
Sizes 4 ½, 5, 5 ½, 6, 7, 8, 9, 10 inches

Sizes 7, 8, 9, 10 inches

Style No. 2
Showing damper inside of pipe—draft is closed and checked

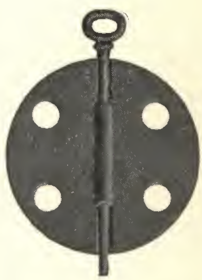


Style No. 3
Sizes 7, 8, 9, 10 inches



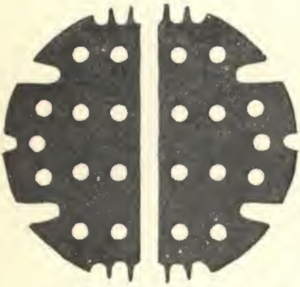
Style No. 8 Universal damper
Sizes 7, 8, 9 inches

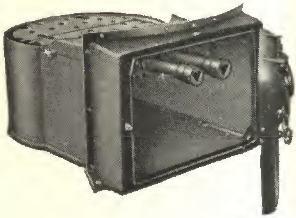
Damper Regulator
Dial, with 27 ft. of Sherardized chain, pulleys, etc., is sent with Dampers Nos. 2, 3, 8



Perforated Damper
Sizes 6, 7, 8, 9, 10, 11, 12, 14 inches

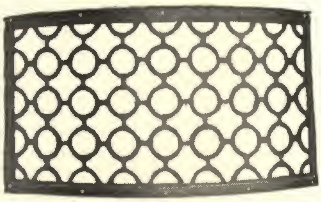
Perforated Cast-Iron Plates for Wood Fuel





To lie over triangular grates for wood fuel. They are easily placed through the feed door opening.

Cold Air Panels



Black Iron Finish

These panels are sent with heaters when ordered, and specified extra.

They admit cold air from the cellar, into the lower part of the casing.

For Heat Pipe Capacity Inches	Size Cold Air Panel	Number with Heater	Fits Casing Diameter Inches
240	13 x 18	1	32
300	13 x 24	1	36
400	13 x 16	2	40
525	13 x 21½	2	44
625	15 x 23½	2	50
800	15 x 30	2	55

Natural Gas Ring

Fourth Pattern Gas Ring can be supplied when specified for

"Perfect" 2901, 2902, 2904, 2906.

"Perfect" 217, 219, 222, 224, 226, 229E.

"Perfect" 117, 119, 122, 124, 126.

"Perfect" 319, 322, 324, 326.

A solid base ring can be supplied for the Nos. 219, 222, 224 "Perfect" Heaters when necessary. The regular base fits in the center section, and is substantially supported. No extra charge for this special equipment.

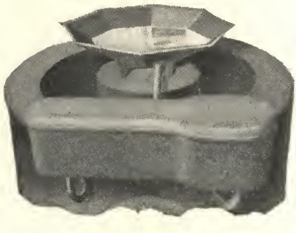
Solid Base Ring

Two-piece, heavy corrugated firepots for Nos. 219 to 229E and 901 to 906 Heaters can be furnished, when preferred, although they should be ordered as special equipment. No extra charge will be made.

Two-piece Corrugated Firepot

Automatic Humidifier

When the warm air is properly moistened, a lower temperature is comfortable. The "Richardson" Automatic Humidifier has an outer supply pan, and an inner evaporation pan, resting on the radiator. In this position the air gets its proper amount of moisture for each room. An automatic valve, connected to the water line, keeps the outer pan properly filled, without attention. This complete equipment is an extra charge, but this small cost is more than justified by the convenience and comfort.



Richardson Automatic Humidifier
Requires ⅛-Inch feed pipe

Research tests claim that 1.09 gallons of water should be evaporated hourly to provide 40% humidity, 69° indoors, 0° outdoors, in a home requiring approximately 500 sq. in. Warm Air Pipe area. The daily average evaporation would be much less. Therefore, we show minimum and maximum evaporation.

Size	Capacity Gal. Water	For Pipe Capacity, ins.	Evaporates Average Gals. Water Daily
20	2	240— 900	8—17
24	3	1000—1400	18—25

Equipment Data

Any style, other than regular equipment dampers, will be furnished without extra charge, but must be specified when ordering. It is understood, however, that we will not make up special dampers or piping. Sizes of each style damper are shown.

All heaters have openings for domestic water coil, unless specified otherwise.

Shaker and poker are shipped with each heater.

Each heater has waterpan, frame and cover, without extra charge.

Cold air panels must be specified when needed.

Brickset heaters have steel smoke pipe collar extension to carry through brick wall.

An adequate amount of asbestos cement comes with each heater, as well as bolts and other materials necessary to set it up complete.

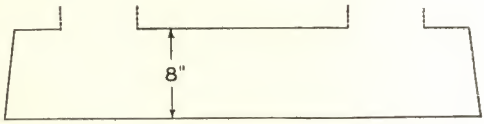
Battery form cases, and bonnets will be made upon request for each heater in this catalogue.

We recommend stove size anthracite, and small lump size bituminous fuel. Each heater for bituminous fuel has smoke curtain in upper part of body or feed section.

Standard Type of Bonnets

The low flat top bonnet is best when leaders are taken from the top of bonnet. Top level of all pipe elbows should be same.

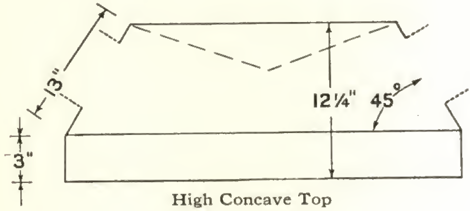
Diameter of top of bonnet is 4 inches less than diameter of cases.



Low Flat Top

The high concave top bonnet is used when leaders are taken from the side of the bonnet. If necessary to use larger than 12 inch leader, specify when ordering and bonnet will be made properly.

The total height of Heater with bonnet is easily determined by adding 8 inches for low bonnet, and 12¼ inches for high bonnet, to height of panel front.



High Concave Top

Casing Dimensions—2900 Series "Perfect" Heaters

	2901	2902	2904	2906	2908
Circumf. of bonnet hole to hole, in.	146¾	165½	181⅞	193½	215¾
Circumf. of casing hole to hole, in.	121¾	139⅜	154⅝	166½	181
Height of bottom sect., in.	24 13/16	29½	29½	31	32
Height of top sect., in.	28¾	24⅞	26	26⅞	28
Off to center of water pan, in.	31	26	25½	37	30
Up to Cut Line of Water Pan, In.	1¾	1¾	1¾	1¾	1¾
Height to bottom of smoke hole, in.	17	11 13/16	13½	14¼	14
Diam. of smoke hole, in.	8	9	9	10	10

Casing Dimensions—2930 Series "Perfect" Heaters

	2931	2932	2934	2936	2938
Circumf. of bonnets, in.	146¾	165½	181⅞	193½	215¾
Circumf. of casing, in.	121¾	139⅜	154⅝	166½	181
Height of bottom casing, in.	24 13/16	29½	29½	31	32
Height of top casing, in.	28¾	24⅞	26	26⅞	28
Height to bottom of smoke hole, in.	17	11 13/16	13½	14¼	14
Size of smoke hole, in.	8	9	9	10	10
Off to center of water pan, in.	31	26	25½	37	30
Up to bottom of water pan, in.	1¾	1¾	1¾	1¾	1¾

Casing Dimensions—200 Series "Perfect" Heaters

	217	219	222	224	226	229-V
Circumf. of bonnet, in.	99 9/16	112⅜	124 13/16	137 5/16	157¼	168⅜
Circumf. of casing, in.	79¾	90 7/16	100	110⅞	130	142⅛
Height of bottom casing, in.	23¾	24⅞	25	25	25	28
Height of top casing, in.	23	21⅞	22¼	23¾	23¾	25¼
Height to center of smoke hole, in.	15⅞	12⅞	14 7/16	15⅜	17½	15¾
Size of smoke hole, in.	8½	9½	10⅛	10⅛	10⅛	8

Casing Dimensions—100 Series "Perfect" Pipeless Heaters

	117	119	122	124	126
Circumf. of out bonnet, in.	133 9/16	148	166 5/8	182	196 1/2
Circumf. of in bonnet, in.	99 9/16	112 1/2	124 13/16	137 5/16	157 1/4
Height of out bonnet, in.	15	15	15	15 1/2	15
Height of in bonnet, in.	13	14	15 1/4	15 1/4	17 1/4
Circumf. of out casing, in.	105	117 1/4	132	145	159
Circumf. of in casing, in.	79 3/8	90 5/8	100 3/16	111	130 1/8
Height of out casing bottom, in.	27 5/8	27 1/4	23 3/8	25	25 1/4
Height of out casing top, in.	22	22 3/8	27	26 7/8	27
Height of in casing, in.	36 1/2	37	37 1/2	38 7/8	38 7/8

See additional data of Re-circulating heaters below.

Casing Dimensions—"Perfect" Re-Circulating Heaters

	319	322	324	326
Circumf. of out bonnet, in.	148	166 5/8	182	196 1/2
Circumf. of in bonnet, in.	112 1/2	124 13/16	137 5/16	157 1/4
Height of out bonnet, in.	12	12	12	12
Height of in bonnet, in.	14	15 1/4	15 1/4	17 1/4
Circumf. of out casing, in.	117 1/4	132	145	159
Circumf. of in casing, in.	90 5/8	100 3/16	111	130 1/8
Height of out casing bottom, in.	27 1/4	23 3/8	25	25 1/4
Height of out casing top, in.	22 3/8	27	26 7/8	27
Height of in casing, in.	37	37 1/2	38 7/8	38 7/8
Height to top of bead in casing, in.	36	36 1/2	37 3/4	37 7/8
Height to center smokehole out casing, in.	10 1/4	16 3/8	16 1/8	17 3/16
Height to center of smoke hole in casing, in.	25 3/4	28 1/8	29 1/4	30 7/8
Height to bottom of water pan out casing, in.	12 1/2	12 1/2	12 1/2	12 1/2
Height to bottom of water pan in casing, in.	3/4	3/4	3/4	3/4
Off to center of water pan out casing, in.	24 1/8	24 1/4	27 1/4	30 1/2
Off to center of water pan in casing, in.	19 3/16	19 1/4	21	25 5/8
Height of in. reg. boot, in.	26 3/8	24 5/8	23 5/8	21 1/4
Circumf. of in. reg. boot, in.	56	67 7/8	74 1/2	86
Size of smoke hole, in.	10	10 1/8	10	10 1/8
Size of opening in center of out bonnet for hot-air pipe, in.	17 7/8	21 3/4	23 5/8	27 3/8
Size of opening for cold-air intake, one on either side, in.	10x14	10x22	10x24	12x30
Height to top of out bonnet, in.	63 1/2	64 1/2	65 3/4	66
Height to top of register, in.	90	90	90	90

Richardson "Perfect" Cooking Ranges

The "Perfect" is made in many styles and sizes. It insures quick meals—is easily managed and is economical in fuel. Its large ovens cook and bake to perfection. Its powerful water back supplies an abundance of hot water. It is attractive in appearance and is strong and durable.

The "Perfect" triangular revolving, ventilating grate bars insure a clean, bright fire. They are easily replaced when necessary. They are the best grates ever used in a cooking range.

Thousands of these "Perfect" Ranges are in daily use throughout the country—giving splendid results.

"Perfect" Ranges have been used by generations and have made an enviable reputation because of their scientific and practical construction, to which we have added such improvements as experience has proven to be of value, yet adhering to our established principle of making our Ranges practical, durable and also ornamental.

Our desire has been to decrease the labor of cooking, lessen the consumption of fuel, and reduce the expense of repairs. This we have successfully accomplished in our "Perfect" Ranges.

Among the many valuable features by which we secure this desirable result are:

Correct construction—by which the proportions of grate, firebox and flue assure the highest efficiency of fuel consumption.

A Removable Grate, which can be taken out without disturbing the brick grate-rest or water-back.

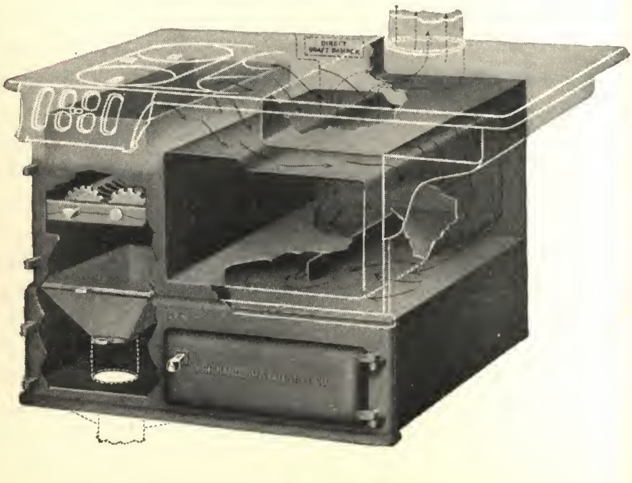
A Large Flue, which distributes the heat equally around the oven, resulting in perfect baking and cooking, with the least expenditure of fuel.

A Large Broiling Door, which is convenient for broiling purposes.

A Heavy and Large Water Back, insuring an abundance of hot water.

An Extra Large, Roomy Oven.

A Foot Attachment for opening oven door.



"Perfect" Enamel Ranges

House owners today require beauty and cleanliness in the kitchen. "Perfect" Ranges made with bright gray enamel finish are most attractive in appearance and make cooking a pleasure.

These ranges are finished with three coats of enamel baked on at a very high temperature, which virtually fuses the enamel with the iron, and is an enduring and lasting polish. They are easy to keep clean—a damp rag removes all dust which might possibly collect. They are fitted with polished iron tops, in keeping with the other attractive features of the range. This does away entirely with the irksome and laborious task of blackening and cleaning necessary with the old type of range.

The slight additional cost for enameled ranges over black ranges should not be considered when compared with the many advantages offered by this new and most attractive feature.

Many architects and thousands of home owners are specifying the "Perfect" Enamel Ranges for their kitchens. We manufacture them for coal and for combination coal and gas in various sizes and styles.

Richardson "Perfect" Combination Coal and Gas Range—No. 428 Gray with Upper Gas Broiler and Hot Closet

This range is constructed for both coal and gas. It has an exceptionally large cooking surface, and large baking and broiling ovens. The gas section and coal section are equally balanced and may be used separately or together, as desired.

Equipped with upper gas broiler and hot closet. Range top has six covers, while the gas section has four large and one simmering burner.

This range, like all the regular coal ranges, is equipped with triangular grate bars, large fire box with ample capacity for a lasting, as well as an economical fire. The check draft and damper control the amount of heat and keep the ovens at an even temperature. Indicators on both coal and gas ovens show the temperature of the ovens.

This range may also be obtained with nickel plated shelf and enamel back, instead of the upper hot closet, if so ordered.

Can also be furnished with ash chute, if desired.

Water back connections may be taken to either right or left side of range.

No. 428 Gray

With Upper Gas Broiler and Hot Closet

Can be fitted with ash chute

Dimensions

Width of Top	49 ½ inches
Depth of Top	28 inches
Height of Range	30 inches
Height with Upper Gas Broiler	60 inches
Height of Plate Shelf	46 ½ inches
Size of Coal Oven	18 x 16 x 12 inches
Size of Gas Oven	18 x 14 x 12 inches
Size of Gas Broiler	18 x 14 x 9 inches
Smokepipe	7 inches
Fire Box	15 x 7 ½ inches

Waterback will heat 40-gallon boiler

Richardson "Perfect" Combination Coal and Gas Range No. 688—Gray with Upper Gas Oven and Boiler

This range has all the advantages of either a coal or gas range combined. It has a large single oven heated by coal and a large high oven heated by gas. A roomy gas broiler on the same level as the gas oven. The coal range has triangular revolving grate bars also a hot closet below coal oven. Four coal lids on range top and four sufficiently large gas burners.

A number of important things about this range are: Dust-proof fire box which prevents dirt from falling on the floor when shaking grate bars, concealed door catches which prevent collection of dust, rounded hinges which assure ease of cleaning as cloth will not catch. This range is neat and attractive in appearance.

No. 688

With Upper Gas Oven and Broiler

Can be fitted with ash chute

Dimensions

Width of Top	43 ½ inches
Depth of Top	26 inches
Width of Range overall	48 inches
Depth of Range overall	29 inches
Height to Range Top	31 inches
Height with Upper Gas Broiler and Oven	63 ½ inches
Size of Coal Oven	18 x 18 x 12 inches
Size of Gas Oven	20 x 16 x 11 inches
Size of Gas Broiler	15 x 11¾ x 9 ¼ inches
Smokepipe	7 inches
Fire Box	15 ¼ x 7 ½ inches

Waterback, connections at rear, will heat 40-gallon boiler
Replacing the No. 88 Range

Richardson "Perfect" Combination Coal and Gas Range No. 488—Gray

The No. 488 Gray Combination Range combines all the good features of either a coal or a gas range. The large 20-inch single oven heated by coal and the elevated 18-inch gas oven give ample space for baking either separately or together.

The gas broiler is at a convenient height and of sufficient size to meet all requirements. This range has dock-ash bars, but may have triangular revolving grate bars.

The eight lids on the range top consist of four coal and four gas openings.

We call particular attention to the extra size gas top; to the dust-proof fire-box which prevents dirt falling on the floor, and to the ash-pan concealed in the skirt base, all of which add to the qualities of the range and to its serviceability.

The range is neat and attractive in appearance and as is the case with all our enamel ranges is very easily cleaned.

No. 488 Gray

With Upper Gas Oven and Broiler

Dimensions

Width of Top	43 inches
Depth of Top	28 ½ inches
Width of Range Overall	48 inches
Depth of Range Overall	38 inches
Height to Range Top	33 ½ inches
Height with Upper Gas Broiler	66 inches
Size of Coal Oven	20 x 20 x 11 inches
Size of Gas Oven	20 x 16 x 11 inches
Size of Gas Broiler	15 x 16 x 9 inches
Smokepipe	6 inches
Fire Box Dimensions	16 x 7 inches

Waterback connections at rear, will heat 40-gallon boiler. Replacing the No. 288X Range

Richardson "Perfect" Coal Range No. 882—Gray with Upper Hot Closet, can be fitted with Ash Chute

A very high grade single oven coal range, finished in gray enamel. It is equipped with an upper hot closet, and can also be fitted with ash chute, if desired. Like all Richardson "Perfect" Coal Ranges, it is fitted with triangular revolving grate bars, which can be removed without disturbing the brick, grate-rest or waterback. Has large top, containing six covers and large broiling door. Waterback will heat 40-gallon boiler.

A number of important things about this range are: Dust-proof fire box which prevents dirt from falling on the floor when shaking grate bars, concealed door catches which prevent collection of dust, rounded hinges which assure ease as cloth will not catch.

No. 882 Gray

With Upper Hot Closet

Can be fitted with ash chute

Dimensions

Width of Top	39 inches
Depth of Top	27 inches
Width of Range overall	46 inches
Height of Range	31 inches
Height with Plate Shelf	47 ½ inches
Height with Upper Hot Closet	59 inches
Size of Oven	18 x 18 x 12 inches
Smokepipe	7 inches
Fire Box	15 ¼ x 8 inches

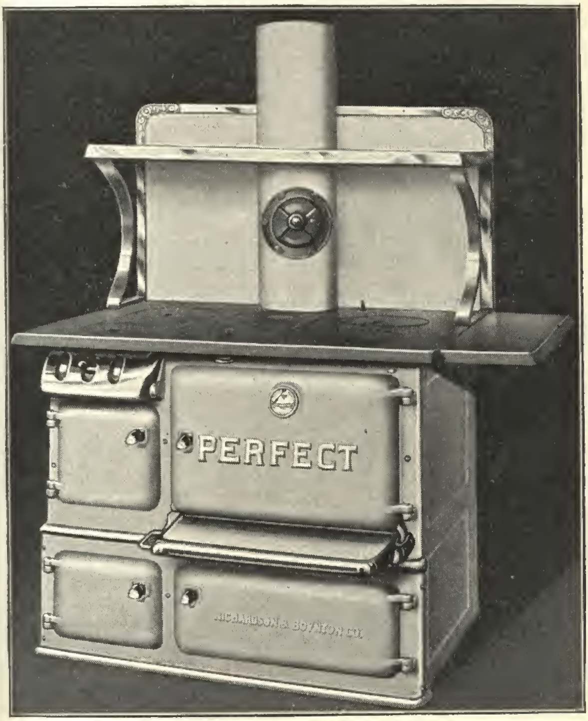
Waterback, connections at side, will heat 40-gallon boiler
Replacing No. 658E Range

Richardson "Perfect" Coal Range No. 862— Gray with Nickel Plate Shelf and Enamel Back

This is a high grade single oven coal range. It is equipped with nickel plated shelf, removable grate, either duplex or flat, for coal or wood. The cooking top is large, and has six covers. There is a large broiling door, and a large heavy waterback that will heat 35-gallon boiler.

This range is illustrated in the enamel type, but can be furnished in plain black, if so desired.

A number of important things about this range are: Dust-proof fire box which prevents dirt from falling on the floor when shaking grate bars, concealed door catches which prevent collection of dust, rounded hinges which assure ease as cloth will not catch.



No. 862 Gray

With Nickel Shelf and Enamel Back

Can be fitted with ash chute

Dimensions

Width of Top	36 inches
Depth of Top	26 inches
Width of Range overall	43 inches
Height of Range	30 inches
Height with Plate Shelf	46½ inches
Height with Upper Hot Closet	58 inches
Size of Oven	17 x 17 x 11 inches
Smokepipe	7 inches
Fire Box	13½ x 7½ inches

Waterback, connections at side, will heat 35-gallon boiler

Replacing No. 448E Range

Richardson "Perfect" Coal Range No. 108-20 Grand Gray

"Perfect" Ranges were designed not only to meet the demand for an attractive range, but to secure the quickest and most satisfactory cooking results. Their operation is very simlpe; one slide damger gives positive control over the fire at all times. They are noted for their quick baking qualities; the flue travel is such that ovens are uniformly heated.

"Perfect" Ranges have every modern improvement that up-to-date designing ability can suggest; they are perfect in construction and operation. Their plain design and smooth finish are generally appreciated, making them as easy to keep clean as they are attractive in appearance. The nickel work is detachable without the necessity of removing nuts and bolts.

All "Perfect" Ranges have the same grade of materials and the same careful workmanship; the different names denote merely different sizes, not different qualities.

No. 108-20 Grand Gray

Single Mantel and Tea Shelf

Dimensions

Width of Top with Shelf	44 ½ inches
End Shelf	7 inches
Height of Top	32¾ inches
Depth of Top	29 inches
Width of Top with Gas Oven	54 inches
Width of Top with Reservoir	52¾ inches
Size of Oven	22 x 20 x 11 inches
Fire Box	16 x 7 inches
Height with Tea Shelf	44 ½ inches
Height including Single Mantel	54 inches
Height including Double Mantel	55¾ inches
Smokepipe	6 inches

Waterback, connections at rear, will heat 40-gallon boiler

Richardson "Perfect" Combination Coal and Gas Range—No. 428 with Upper Gas Broiler and Hot Closet

This range is constructed for both coal and gas. It has an exceptionally large cooking surface, and large baking and broiling ovens. The gas section and coal section are equally balanced and may be used separately or together, as desired.

Equipped with upper gas broiler and hot closet. Range top has six covers, while the gas section has four large and one simmering burner.

This range, like all the regular coal ranges, is equipped with triangular grate bars, large fire box with ample capacity for a lasting, as well as an economical fire. The check draft and damper control the amount of heat and keep the ovens at an even temperature. Indicators on both coal and gas ovens show the temperature of the ovens.

This range may also be obtained with nickel plated shelf and enamel back, instead of the upper hot closet, if so desired.

Can also be furnished with ash chute, if desired.

Waterback connections may be taken to either the right or left side of range.

No. 428

With Upper Gas Broiler and Hot Closet

Can be fitted with ash chute

Dimensions

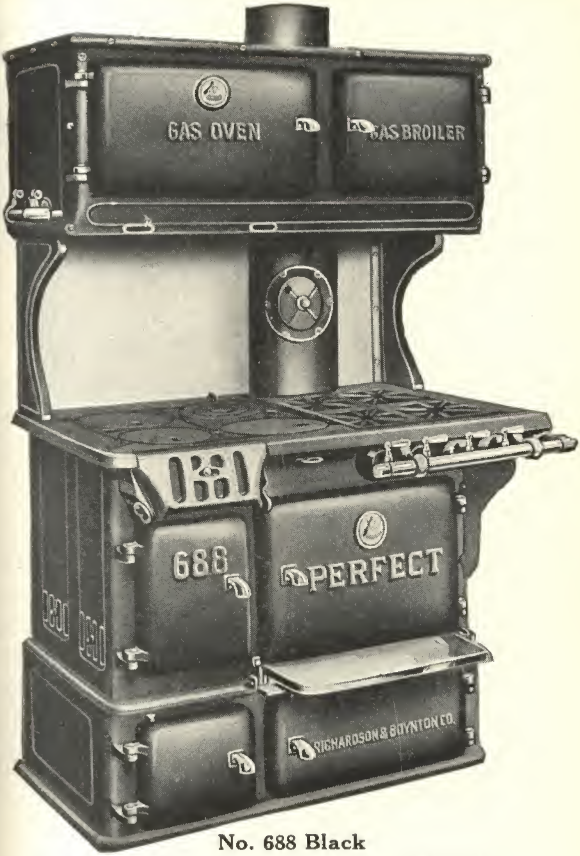
Width of Top	49 ½ inches
Depth of Top	28 inches
Height of Range	30 inches
Height with Upper Gas Broiler	60 inches
Height of Plate Shelf	46 ½ inches
Size of Coal Oven	18 x 16 x 12 inches
Size of Gas Oven	18 x 14 x 12 inches
Size of Gas Broiler	18 x 14 x 9 inches
Smokepipe	7 inches
Fire Box	15 x 7 ½ inches

Waterback will heat 40-gallon boiler

Richardson "Perfect" Combination Coal and Gas Range No. 688—with Upper Gas Oven and Broilers

This range has all the advantages of either a coal or gas range combined. It has a large single oven heated by coal and a large high oven heated by gas. A roomy gas broiler which is on the same level as the gas oven. The coal range has triangular revolving grate bars also a hot closet below coal oven. Four coal lids on range top and four sufficiently large gas burners.

A number of important things about this range are: Dust-proof fire box which prevents dirt from falling on the floor when shaking grate bars, concealed door catches which prevent collection of dust, rounded hinges which assure ease as cloth will not catch. This range is neat and attractive in appearance.



No. 688 Black

With Upper Gas Oven and Broiler

Can be fitted with ash chute

Dimensions

Width of Top	43 ½ inches
Depth of Top	26 inches
Width of Range overall	48 inches
Depth of Range overall	29 inches
Height to Range Top	31 inches
Height with Upper Gas Broiler and Oven	63 ½ inches
Size of Coal Oven	18 x 18 x 12 inches
Size of Gas Oven	20 x 16 x 11 inches
Size of Gas Broiler	15 x 11¾ x 9¼ inches
Smokepipe	7 inches
Fire Box Dimensions	15 ½ x 7 ½ inches
Gas Water Heater	8 x 15 inches

Waterback, connections at rear, will heat 40-gallon boiler
Replacing the No. 88 Range

Richardson "Perfect" Combination Coal and Gas Range No. 488

This range has all the advantages of both a coal and a gas range combined.

The No. 488 is regularly equipped with the elevated gas oven and broiler and the larger lower oven is for use with coal. We call particular attention to the roomy, elevated gas broiler and gas oven which are at convenient height for cooking purposes.

The fire-box has the dock-ash bars and may be supplied with triangular revolving grate bars if necessary. Four coal lids on the range top and an extra large size four-burner gas top.

We call particular attention to the fact that this range has dust-proof fire-box which prevents dirt and ashes from falling on the floor when grate bars are shaken. It also has concealed door catches which prevent the collection of dust, rounded hinges which assure ease of cleaning, and most important this range has an ash-pan concealed in the skirt base beneath the fire-box. This accessory is unique in this type of range.

No. 488 Black

With Upper Gas Oven and Broiler

Dimensions

Width of Top	43 inches
Depth of Top	28 ½ inches
Width of Range Overall	48 inches
Depth of Range Overall	38 inches
Height to Range Top	33 ½ inches
Height with Upper Gas Broiler	66 inches
Size of Coal Oven	20 x 20 x 11 inches
Size of Gas Oven	20 x 16 x 11 inches
Size of Gas Broiler	15 x 16 x 9 inches
Smokepipe	6 inches
Fire Box Dimensions	16 x 7 inches

Waterback connections at rear, will heat 40-gallon boiler. Replacing the No. 288X Range

Richardson "Perfect" Coal Range No. 108-20 Grand Range

"Perfect" Ranges were designed not only to meet the demand for an attractive range, but to secure the quickest and most satisfactory cooking results. Their operation is very simple; one slide damper gives positive control over the fire at all times. They are noted for their quick baking qualities; the flue travel is such that ovens are uniformly heated.

"Perfect" Ranges have every modern improvement that up-to-date designing ability can suggest; they are perfect in construction and operation. Their plain design and smooth finish are generally appreciated, making them as easy to keep clean as they are attractive in appearance. The nickel work is detachable without the necessity of removing nuts and bolts.

All "Perfect" Ranges have the same grade of materials and the same careful workmanship; the different names denote merely different sizes, not different qualities.

No. 108-20

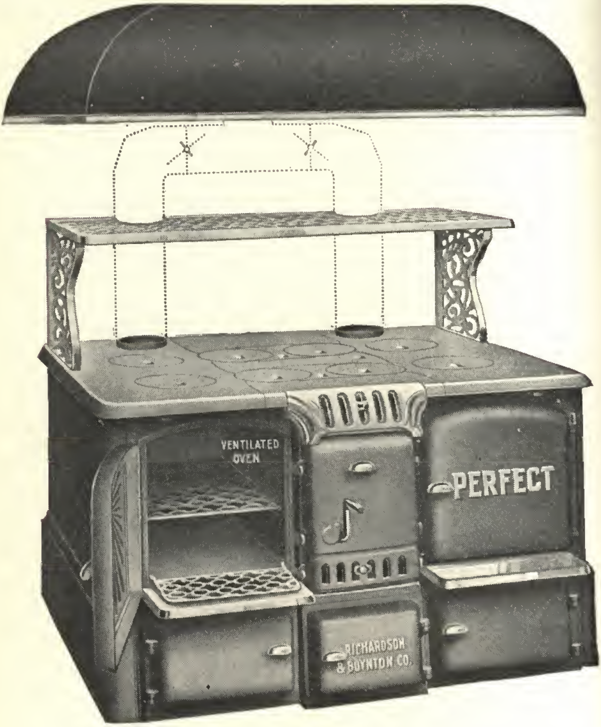
"Perfect" Grand Range

With Double Mantel

Dimensions

Width of Top with Shelf	44½ inches
End Shelf	7 inches
Height of Top	32¾ inches
Depth of Top	29 inches
Width of Top with Gas Oven	54 inches
Width of Top with Reservoir	52¾ inches
Size of Oven	22 x 20 x 11 inches
Fire Box	16 x 7 inches
Height with Tea Shelf	44½ inches
Height including Single Mantel	54 inches
Height including Double Mantel	55¾ inches
Height with Upper Hot Closet	60¾ inches
Smokepipe	6 inches

Waterback, connection at rear, will heat 40-gallon boiler

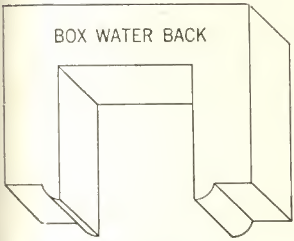


No. 111E-112E-114E

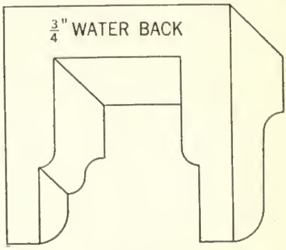
Richardson "Perfect" Double Oven Coal Range

Either Portable or Brick Set

	No. 111E Inches	No. 112E Inches	No. 114E Inches
Size of Top	49 ½ x 28	53 x 30	60 x 31
Height with Base	28 ½	28 ½	28 ½
Height with Plate Shelf	45 ½	45 ½	45 ½
Height with Upper Hot Closet	56 ¼	56 ¼	56 ¼
Size of Ovens	20 x 12 x 14	20 x 13 x 14	20 x 16 x 14
Brick set, jamb opening	42	46	54
Smokepipe, bottom	6	6	7
Smokepipe, top	7	7	8
Fire Box	14 ½ x 8¾	15 ½ x 9 ½	15 ½ x 10 ½



For 50-Gallon Boiler



For 60—80-Gallon Boiler

Powerful Waterbacks insure plenty of Hot Water

These ratings do not apply when circulating system is used

Above Waterbacks for 112E Ranges only

Canopy Measurements

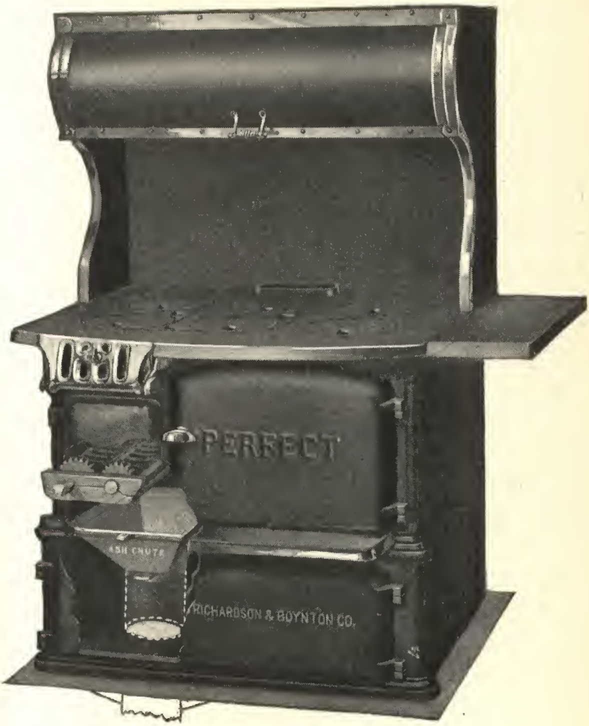
	No. 111E Inches	No. 112E Inches	No. 114E Inches
Depth	32	32	32
Height	18	18	18
Length	56	66	72

Richardson "Perfect" Single Oven Coal Range No. 278 with Upper Hot Closet and Ash Chute

The Richardson "Perfect" Ranges can be fitted with ash chutes as shown in cut, by which ashes are dropped directly into an ash can or ash pit in the cellar. It does away with the dust and annoyance of removing ashes in the kitchen.

This attachment consists of ash chute, one damper and three joints galvanized pipe. It can be fitted to all of our ranges having lower closets.

We do not supply ash cans.



No. 278

Richardson "Perfect" Single Oven Coal Range With Upper Hot Closet and Ash Chute

Dimensions

Size of Top, less End Shelf	39 ½ x 30 inches
Size of Top, with End Shelf	46 ½ x 30 inches
Height of Range	30 inches
Height with Plate Shelf	47 inches
Height with Hot Closet	57 inches
Size of Oven	20 x 20 inches
Smokepipe	7 inches
Brick set, jamb opening	33 x 12 inches
Fire Box	17 ½ x 8 ½ inches

Waterback, connections at side, will heat 40-gallon boiler

Richardson "Perfect" Coal Range No. 882—with Upper Nickel Plate Shelf

A very high grade single oven coal range. It is equipped with an upper nickel shelf and can also be fitted with ash chute, if desired. Like all Richardson "Perfect" Coal Ranges, it is fitted with triangular revolving grate bars, which can be removed without disturbing the brick, grate rest or waterback. Has large top, containing six covers and large broiling door. Waterback will heat 40-gallon boiler.

A number of important things about this range are: Dust-proof fire box which prevents dirt from falling on the floor when shaking grate bars; concealed door catches which prevent collection of dust; rounded hinges which assure ease as cloth will not catch.

No. 882

Richardson "Perfect" Single Oven Coal Range

With Nickel Plate Shelf or Upper Hot Closet

Dimensions

Width of Top	39 inches
Depth of Top	27 inches
Width of Range overall	46 inches
Height of Range	31 inches
Height with Plate Shelf	47½ inches
Height with Upper Hot Closet	59 inches
Size of Oven	18 x 18 x 12 inches
Smokepipe	7 inches
Fire Box	15¼ x 8 inches

Waterback, connections at side, will heat 40-gallon boiler

Richardson "Perfect" Coal Range No. 862—with Nickel Plate Shelf

This is a high grade single oven coal range. It is equipped with nickel plated shelf, removable grate, either duplex or flat, for coal or wood. The cooking top is large, and has six covers. There is a large broiling door, and a large heavy waterback that will heat 35-gallon boiler.

This range is illustrated in the black finish, but can be furnished in gray enamel, if so desired.

A number of important things about this range are: Dust proof fire box which prevents dirt from falling on the floor when shaking grate bars, concealed door catches which prevent collection of dust, rounded hinges which assure ease as cloth will not catch.

No. 862

Richardson "Perfect" Single Oven Coal Range

With Nickel Plate Shelf or Upper Hot Closet

Dimensions

Width of Top	36 inches
Depth of Top	26 inches
Width of Range overall	43 inches
Height of Range	30 inches
Height with Plate Shelf	46 ½ inches
Height with Upper Hot Closet	58 inches
Size of Oven	17 x 17 x 11 inches
Smokepipe	7 inches
Fire Box	13 ½ x 7 ½ inches

Waterback, connections at side, will heat 40-gallon boiler

No. 395E

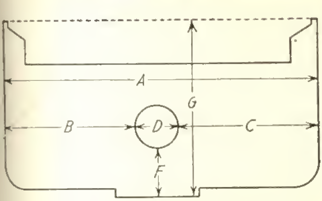
Richardson "Perfect" Single Oven Coal Range

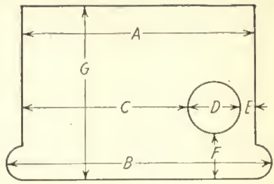
With Skeleton Base and Cast Plate Shelf

Dimensions

Width of Top	33 ¼ inches
Depth of Top	23 ¼ inches
Height of Top	28¾ inches
Height with Plate Shelf	45 inches
Height with Upper Hot Closet	56¾ inches
Size of Oven	16 x 17 inches
Smokepipe	6 inches
Fire Box	13 ½ x 7 inches

Waterback, connections at side, will heat 30-gallon boiler





Detail for Locating Ash Chute in Range Bottom

Ash Chute Measurements				
	No. 111E	No. 112E	No. 114E	No. 428
	In.	In.	In.	In.
A	49½	54½	62½	49½
B	21¼	23¾	27¾	20¼
C	21¼	23¾	27¾	22
D	7	7	7	7¼
F	9	9	9¼	5½
G	29	31	31	25¾

Ash Chute Measurements				
	No. 861-395E	No. 881	No. 278	No. 688
	In.	In.	In.	In.
A	30	33¼	34½	35½
B	33¾	36½	37	35½
C	20¾	23½	24⅝	24½
D	7¼	7¼	7¼	7¼
E	2	2½	2⅝	4
F	6¼	6½	6	5¾
G	23½	25¾	28	25

Sketch above shows right-hand Range Measurements. Left-hand Range Measurements are the same with ends reversed

"Perfect" Gas Ranges

SATISFACTORY cooking at low cost is a vital point of interest to the home owner or user of cooking apparatus.

The result of tests on these ranges in 168 cases where conditions were carefully studied, is therefore of interest.

The ranges were used as in the average household where all of the cooking and baking was done for the entire family. The actual conditions met within every family prevailed.

During the period of a month, 168 gas bills were rendered. Of these 111 were for 1,000 ft. of gas. Thirty-seven used gas less than 1,000 ft., while only 20 had gas bills of more than 1,000 ft.

This means cooking and baking for a family with a consumption of only 1,000 feet of gas per month

"Perfect" Ranges Make Cooking a Pleasure

THEY are equipped with every modern improvement. All cooking surfaces are at the most convenient height and of the correct size for the greatest possible economy in operation.

The oven burners maintain an even quality of heat when they are operated at one-third or two-thirds capacity as certainly as they do when they are turned on full. This is a most important aid to obtaining the best results and economy in baking, cooking or preheating.

All ranges are designed with round corners in order to avoid the collection of dust and in order to make the cleaning of the range easy.

Enamel parts are finished in genuine vitreous enamel of the highest quality.

All bolts are invisible. This adds materially to the appearance of the range.

"Perfect" Ranges are endorsed and approved by gas companies and institutes.

They please the cook

"Perfect" Gas Range

No. 6-18

All vitreous enamel range.

No bolts visible in body of range.

Cooking top has three full size burners, one giant burner, one simmerer burner, one oven and broiler burner, and self-lighter.

Dimensions

Baking Oven, 18¼ inches wide, 18¼ inches deep, 13 inches high.

Broiling Oven, 18¼ inches wide, 18¼ inches deep, 9 inches high.

Cooking Top, 27 inches wide, 23 inches deep.

Outside measurements with Shelf, 49 inches wide, 26½ inches deep.

Height, 51 inches. End Shelf, 4 inches.

Weight, 300 pounds.

All Enamel

No. 6-18

Either right or left hand oven as you face range

"Perfect" Gas Range

No. 6-16

All enamel range.

No bolts visible in body of range.

Cooking top has three full size burners, one giant burner, one simmerer burner, one oven broiler burner and self-lighter.

Dimensions

Baking Oven, 16¼ inches wide, 18¼ inches deep, 13 inches high

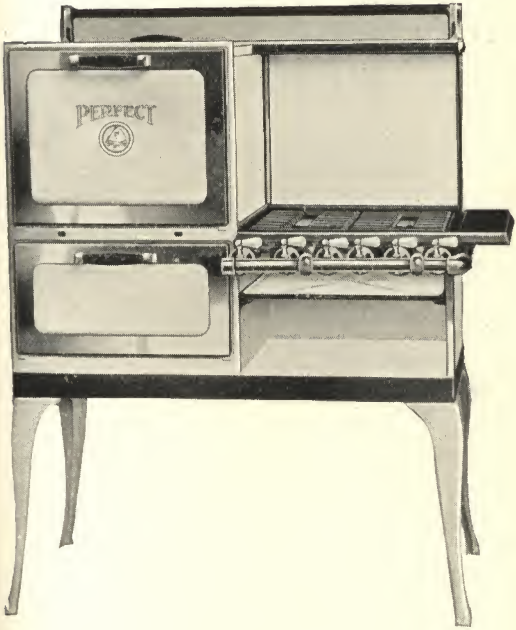
Broiling Oven, 16¼ inches wide, 18¼ inches deep, 9 inches high..

Cooking Top, 23¼ inches wide, 22 inches deep.

Outside measurements, with End Shelf, 43 inches wide, 25¼ inches deep.

Height, 51 inches. End Shelf, 4 inches.

Weight, 260 pounds.



All Enamel Finish

No. 6-16

Either right or left hand oven as you face range

"Perfect" Gas Range

No. 6-14

All enamel finish.

No bolts visible in body of range.

Cooking top has three full-size burners, one giant burner, one simmerer burner, one oven and broiler burner, and self-lighter.

Dimensions

Baking Oven, 14¼ inches wide, 18¼ inches deep, 13 inches high

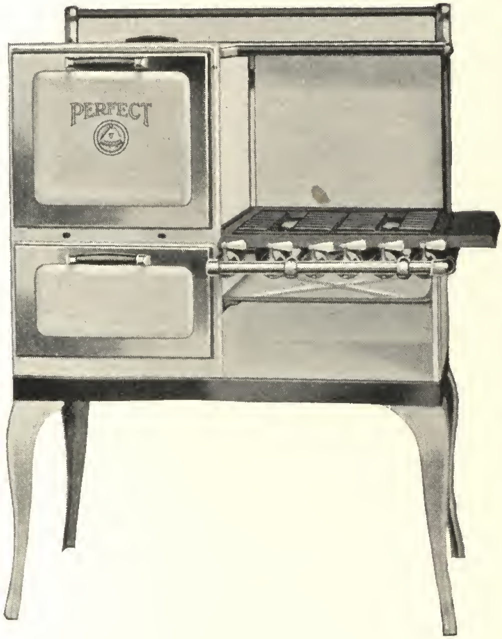
Broiling Oven, 14¼ inches wide, 18¼ inches deep, 9 inches high

Cooking Top, 23¼ inches wide, 22 inches deep.

Outside measurements, with End Shelf, 41 inches wide, 25¼ inches deep.

Height, 51 inches. End Shelf, 4 inches.

Weight, 240 pounds.



All Enamel

No. 6-14

Either right or left hand oven as you face range

"Perfect" Full Enamel Range

No. 65-22

One large and one small baking oven, and one broiling oven.

Cooking top has six burners, simmering burners and self-lighter.

Dimensions

Baking Oven (upper), 15 inches wide, 18¼ inches deep, 12½ inches high.

Baking Oven (lower), 22¼ inches wide, 18¼ inches deep, 13 inches high.

Broiling Oven, 15 inches wide, 18¼ inches deep, 10 inches high.

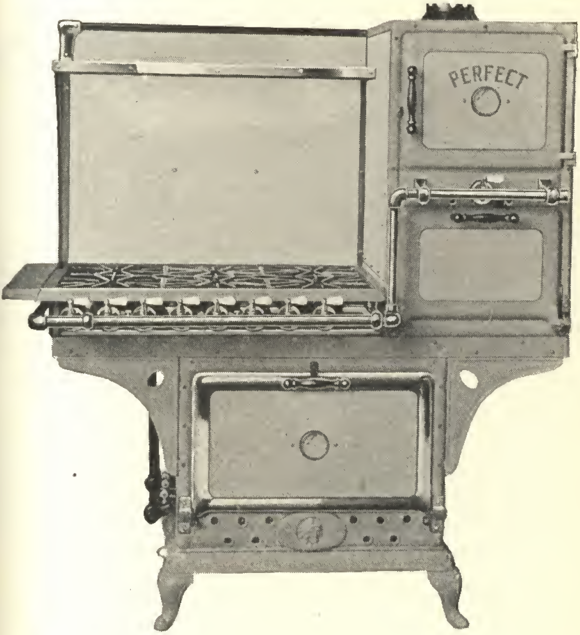
Cooking Top with Shelf, 36½ inches wide, 22 inches deep.

Outside measurements, with Shelf, 54¼ inches wide, 28½ inches deep.

Outside measurements, without Shelf, 50¼ inches wide, 28½ inches deep.

Height overall, 57½ inches.

Weight crated, 456 pounds.



All Enamel

No. 65-22

Either right or left hand oven as you face range

"Perfect" Semi-Enamel

No. 45-22

One large and one small baking oven, and one broiling oven.

Cooking top has six burners, simmering burners and self-lighter.

Dimensions

Baking Oven (upper), 15 inches wide, 18¼ inches deep, 12½ inches high.

Baking Oven (lower), 22¼ inches wide, 18¼ inches deep, 13 inches high.

Broiling Oven, 15 inches wide, 18½ inches deep, 10 inches wide.

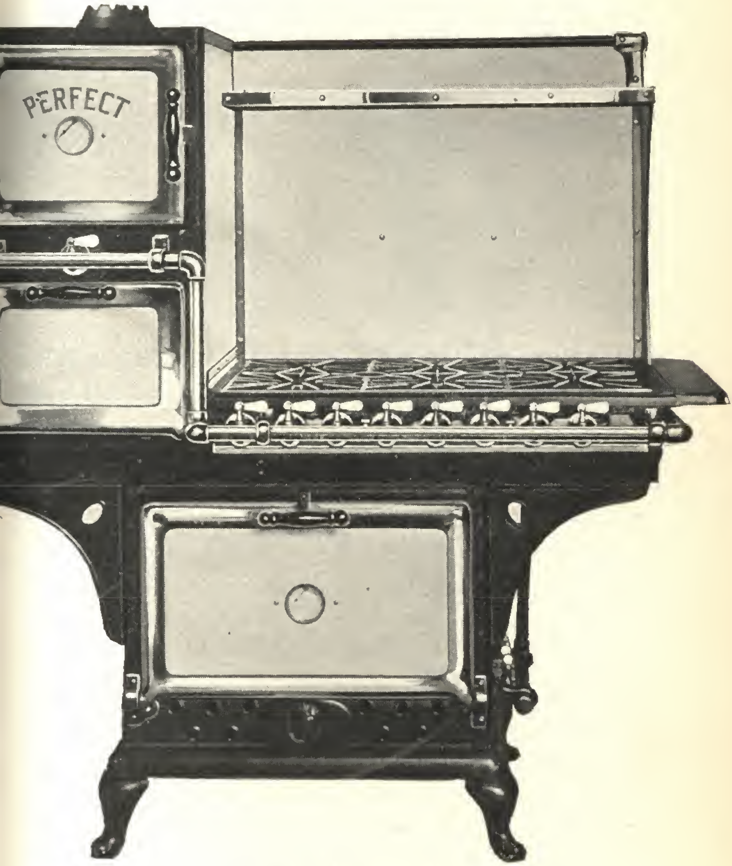
Cooking Top, with Shelf, 36½ inches wide, 22 inches deep.

Outside measurements, with Shelf, 54¼ inches wide, 28½ inches deep.

Outside measurements, without shelf, 50¼ inches wide, 28½ inches deep.

Height overall, 57½ inches.

Weight crated, 443 pounds.



Semi-Enamel

No. 45-22

Either right or left hand oven as you face range

What the Wilcolator on the "Perfect" Range will do

PERFECT cooking results depend on the proper measuring and mixing of ingredients, plus right oven temperature during the time of cooking. Anyone can measure materials and mix them, but how can the housewife be certain that her oven heat is exactly right?

With a "Perfect" Gas Range, equipped with a Wilcolator, this "guess" is taken out of cooking. All that is necessary is to set the dial to produce the proper temperature as indicated by the chart shown in illustration, and automatically the dependable Wilcolator will keep the oven heat just right until it is time to take out the food, which will be "done to a turn" every time.

No More "Oven Watching"

Once the Wilcolator on the "Perfect" Range is set, the housewife can turn her attention to other things. There is no need to try the oven, from time to time, to be sure that it is just right. She knows that the oven heat will be automatically maintained, at the proper temperature.

Note the convenience
of having the cooking
chart right on the dial

An Afternoon of Leisure

THE Wilcolator on the "Perfect" Range cooks the evening meal while she is at the matinee, or doing some much needed shopping. She has simply to follow the directions, place the food in the oven, set the Wilcolator and when she comes home dinner will be piping hot, all ready to serve.

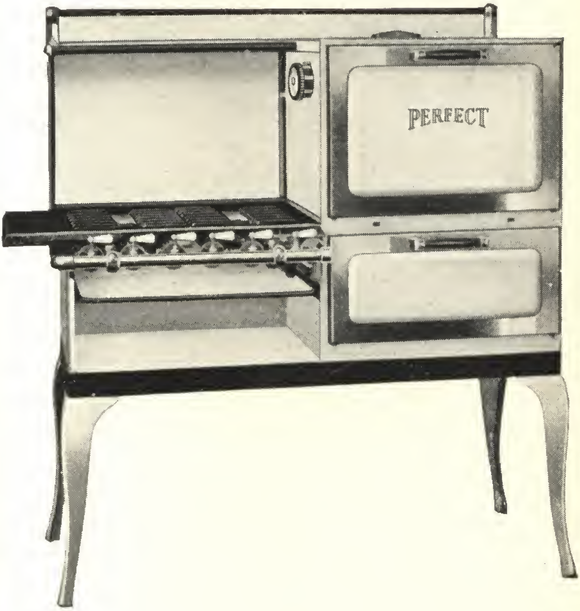
Better Baking Results

For baking the Wilcolator once used, will prove itself indispensable. It will shorten the hours spent in the hot kitchen, and will help to get better results than ever obtained before. Canning by means of the cold pack system, advocated by the U. S. Dept. of Agriculture, is made much easier by the dependable Wilcolator.

More Convenient to Use

With its cooking chart right on the dial and its easy one-hand adjustment the Wilcolator is most convenient to use.

When one adds to this convenience the absolute dependability and accuracy of the Wilcolator, together with its neat appearance, the housewife has a regulator that she will be proud to own.



No. 6-189

Furnished with either right or left hand oven (as you face range)
Wilcolator supplied on 6-189, 6-169, 6-149

"Progressive" Gas Ranges

No. 594

All enamel.

Designed for builders.

Burner top has four full-size burners, oven and broiler burner.

No. 594—All enamel.

No. 394—Semi-enamel, oven and burner side in black.

Dimensions

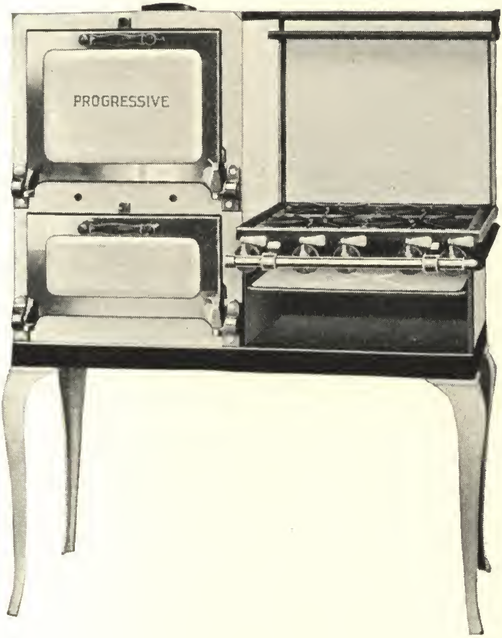
Baking Oven, 16 inches wide, 18 inches deep, 12 inches high.

Broiling Oven, 16 inches wide, 18 inches deep, 6 inches high.

Cooking Top, 22 inches wide, 20 inches deep.

Outside measurements, 39½ inches wide, 24½ inches deep.

Weight, crated, 180 pounds.



All Enamel

No. 594

Either right or left hand oven as you face range

"Progressive" Gas Range

No. 294

Plain finish.

Designed for builders.

Burner top has four full-size burners, oven and broiler burner.

Dimensions

Baking Oven, 16 inches wide, 18 inches deep, 12 inches high.

Broiling Oven, 16 inches wide, 18 inches deep, 6 inches high.

Cooking Top, 22 inches wide, 20 inches deep.

Outside measurements, 39½ inches wide, 24½ inches deep.

Weight, crated, 177 pounds.

Plain Finish

No. 294

Either right or left hand oven as you face range

"Perfect" Four-Burner Cooker

No. 333

No. 333 — Enamel four - burner cooker.

Designed for small apartments.

Burner top has four full-size burners, oven and broiler burner.

No. 231—Cooker same as above except in black finish.

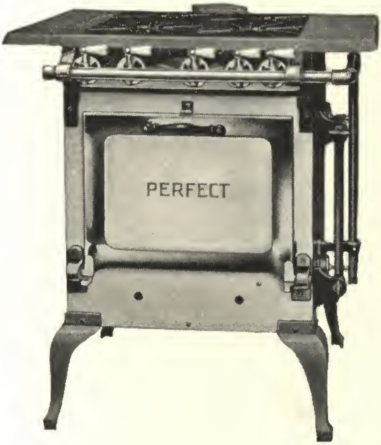
Dimensions

Height to Cooking Top, 31½ inches high.

Size of Top, 23 inches wide, 29 inches deep.

Size of Oven, 16 inches wide, 18 inches deep, 12 inches high.

Weight, 140 pounds.



Enamel

No. 333

Black

No. 231

"Perfect" Three-Burner Cooker

With High Shelf

No. 326

No. 326 — Enamel three - burner cooker with high shelf.

Designed for small apartments.

Burner top has two full-size burners, giant burner, oven and broiler burners.

When ordering specify if high shelf is desired.

No. 224—Cooker, same as above, except in black finish.

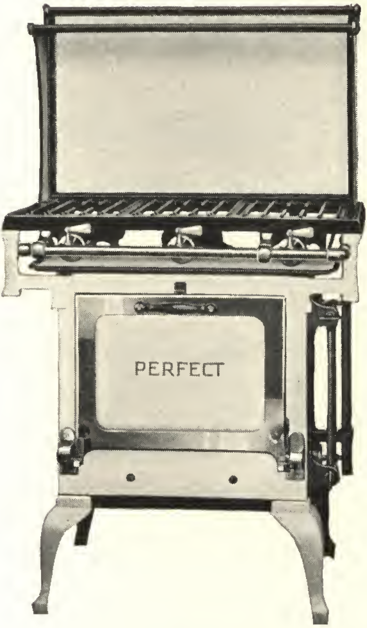
Dimensions

Depth, 14 inches. Width, 28 inches.

Height overall, 32 inches.

Baking Oven, 16 inches wide, 12 inches deep, 13 inches high.

Height of Shelf, 16¾ inches. Weight, 120 pounds.



Enamel

No. 326

Black

No. 224

RICHARDSON

HEATING and COOKING APPARATUS

RICHARDSON Boilers for Steam, Hot Water and Vapor Heating

"PERFECT" Warm Air and Pipeless Furnaces

"PERFECT" Ranges for Coal, Coal and Gas

Black Cast Iron and Gray Enamel Finish

"PERFECT" Laundry and Tank Water Heaters

RICHARDSON Garage Heating Systems

Repair List for

RICHARDSON

"PERFECT" WARM AIR FURNACES

All Repair Invoices are Net 30 Days
F. O. B. Factory or Warehouses

Richardson & Boynton Co.

Manufacturers of

"Richardson" "Perfect"

Heating and Cooking Apparatus

Since 1837

Executive Offices: New York: 260 Fifth Avenue

Boston: 60 High Street
Philadelphia: 1308 Arch Street
Buffalo: 220 Delaware Avenue
Newark: 585 So. 21st Street
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Providence: 58 Exchange Street
Rochester: 70 Exchange Street
Detroit: 4472 Cass Street
Pittsburgh: 605 House Bldg.
St. Louis: 705 Olive Street

Springfield, Mass.: 194 Chestnut Street

WE can furnish many parts, principally firepots, grates, doors, frames, and radiators, for older types of Warm Air Furnaces not shown in this catalogue. We have not been able to replace a few patterns destroyed by fire in 1914. It would be well to inquire before quoting on repair work of inactive furnaces.

Larger space, planned production and a larger personnel enable us to offer prompt service in filling orders for repair parts. We appreciate the necessity of prompt, correct shipments. Whenever repairs are especially urgent because of break-down jobs, we will try to make preference, if you so state.

Please note our suggestions for ordering, so we will not have to ask for further information.

Instructions for Ordering Furnace Repairs

1. Be sure that the full number of furnace is given as shown on the feed door, such as 1044-C or 353-1, **not 1044 or 353.** These serial letters or figures following the number are vitally necessary in order that the correct repairs may be shipped.

2. In case there is no name or letter on the feed door, then state the number shown on the part of the furnace, which you require.

3. In ordering smoke collars for the 300 Series furnaces, state whether the collar is all round, or round at one end and oval at the other end.

Specimen Orders

1. Please send via quickest route one left-hand shaker bar for No. 1044E Furnace.

   (Note: Order clearly specifies which bar and gives full number and letter of Furnace.)

2. Please send via freight one firepot for 24″ pot Furnace. Number plate is missing but old pot is marked Per 92.

   (Note: We have made many different Furnaces with 24″ firepot, and a guess would probably be wrong. In this case the dealer gave us necessary information, and there was no delay in shipping the correct part.)

All Repair Invoices are Net 30 Days
F. O. B. Factory or Warehouses

Gas Rings for Warm Air Furnaces

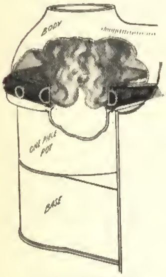
First Pattern

GAS RINGS

FIRST PATTERN Ring forms the bottom section of three-piece firepot

First Pattern

	134a	6 139a	251 8 143a	255 10 147a	261 12 155a	162
Gas Ring..........	**$14.00**	**$28.00**	**$28.00**	**$32.00**	**$36.00**	**$48.00**
Pot for Gas Ring...	**14.00**	**28.00**	**28.00**	**34.00**	**40.00**	**54.00**

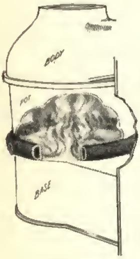


Second Pattern

SECOND PATTERN Ring will fit on top of the one or two-piece firepot

Second Pattern

	1132	1136	1140
Gas Ring...........................	**$14.00**	**$17.00**	**$19.00**
Pot for Gas Ring......................	**20.00**	**27.00**	**27.00**



Third Pattern

THIRD PATTERN Ring will fit under the one or two-piece firepot and will need an extension piece on top of panel front

Third Pattern

	1032 1132	1036 1136	1040 1140	1044 1144	1050 1150
Gas Ring...................	**$14.00**	**$14.00**	**$17.00**	**$19.00**	**$20.00**
Pot for Gas Ring............	**20.00**	**27.00**	**27.00**	**28.00**	**35.00**

Gas Rings and Dampers

(Continued)

Fourth Pattern

Style No 8 Universal damper

Style No. 1 Party closed

Style No 1 Open

Style No 2 Showing damper inside of pipe—draft is closed and checked

Style No 3

FOURTH PATTERN Ring forms the bottom section of the two-piece firepot

Fourth Pattern

	901 248 61 141	902 252 81 144	904 256 101 148	906 262 121 157
Gas Ring	**$27.00**	**$27.00**	**$32.00**	**$41.00**
Pot for Gas Ring	**23.00**	**23.00**	**23.00**	**32.00**

	217 117 317	219 119 319 41	222 122 322 46	224 124 324 51	226 126 326 56	229
Gas Ring	**$23.00**	**$23.00**	**$23.00**	**$23.00**	**$27.00**	**$27.00**
Pot for Gas Ring	**17.00**	**20.00**	**23.00**	**23.00**	**34.00**	**42.00**

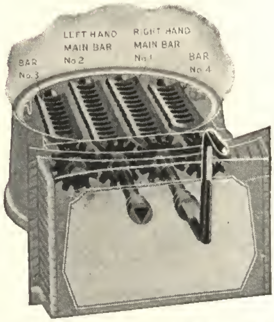
List Prices on Furnace Dampers

No 8 Universal Dampers only 7", 8", 9" **$4.00**

Dial, Chain, Pulleys set **2.00**

	4½"	5"	5½"	6"	7"	8"	9"	10"
No 1 Style Patent Damper	**$1.00**	**$1.10**	**$1.20**	**$1.30**	**$1.50**	**$2.30**	**$2.50**	**$2.60**

	7"	8"	9"	10"
No. 2 Style Patent Damper, only With Weighted Handle	**$1.90**	**$2.70**	**$2.90**	**$3.00**
No 3 Style End Lift Damper	**3.50**	**3.70**	**4.00**	**4.50**

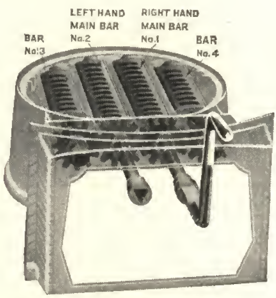


1st Pattern—Style of Grate Bars

When ordering grate bars please state:—

Name of Furnace (shown on feed door.)
Size of Furnace (shown on feed door.)
Which grate bars wanted—1, 2, 3, 4.

The "E" type of grate bar is interchangeable by reversing the cog wheel.



2nd Pattern—Style "E" Grate Bars

900 Series "Perfect" Positive Circulating Furnaces

(See illustration, page 8)

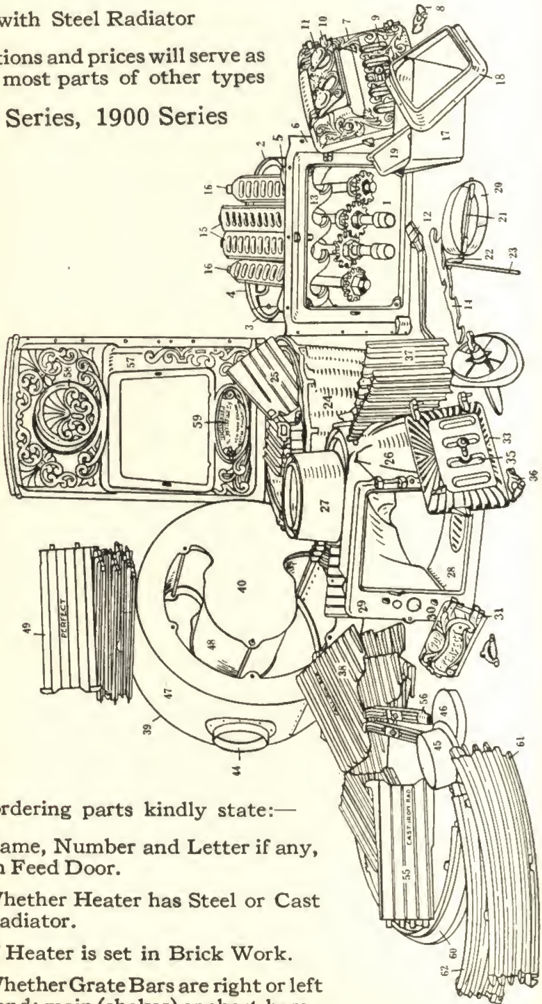
No.	Name of Part	List Prices					
		900	901	902	904	906	908
	BASE						
1	Bottom	$7.00	$10.00	$11.00	$15.00	$21.50	$28.00
2	R Side	4.50	6.00	7.00	9.00	12.50	13.50
3	L Side	4.50	6.00	7.00	9.00	12.50	13.50
4	Back	4.50	5.00	7.00	7.00	12.50	13.50
5	Top	3.50	4.50	5.50	7.50	9.00	14.50
6	Frame	4.00	6.00	6.00	6.00	6.00	10.80
7	Door	8.50	9.00	9.60	10.00	11.60	16.00
8	Door Handle	.30	.30	.30	.30	.30	.30
9	Door Slide	.50	.80	1.20	1.20	1.60	1.60
10	Flap Door	1.60	1.60	1.60	2.00	2.50	2.50
11	Shaker Stopper	.20	.20	.20	.20	.20	.20
12	Shaker	1.50	1.50	1.50	1.50	1.50	2.20
13	Front Grate Yoke	1.20	1.70	1.70	3.00	5.10	5.70
14	Grate Yoke Clamp	.70	.70	.90	1.50		2.30
15	Main Bar, R or L, (each)	4.90	5.80	7.90	11.00	12.50	21.00
16	Short Bar, R or L, (each)	3.30	4.40	5.80	8.20	9.60	16.00
17	Waterpan	6.75	6.75	6.75	6.75	6.75	6.75
18	Waterpan Frame	2.00	2.00	2.00	2.00	2.00	2.00
19	Waterpan Cover	.80	.80	.80	.80	.80	.80
20	S. I. Dust Pipe	1.00	1.00	1.00	1.00	1.00	1.00
21	Dust Damper						
22	Dust Damper Spindle	.70	.70	.70	.70	.70	.80
23	Dust Damper Handle						
	FIREPOT						
24	One-piece Firepot	34.00	41.50	42.50	47.00	70.00	85.00
25	Wings, (each)	.....	.....	.....	.....	.....	.....
	BODY						
26	Body only	21.50	29.00	37.00	42.50	55.00	82.00
27	Extension for Cast Radr	.....	5.50	5.50	5.00	6.00	10.00
28	Lip	3.20	4.00	4.50	5.00	5.50	6.80
29	Frame	3.60	3.60	4.00	4.00	4.40	4.40
30	Frame Pipe Cover	.40	.40	.40	.40	.40	.40
31	Upper Door						
32	Upper Door Lining						
33	Lower Door	8.00	8.00	8.00	9.20	9.20	10.40
34	Lower Door Lining						
35	Door Slide						
36	Door Handle	.30	.30	.30	.30	.30	.30
	STEEL RADIATOR						
39	Bottom Plate	16.50	20.00	27.50	28.50	34.00	53.00
40	Top Plate	18.50	21.50	25.00	31.50	40.00	59.00
41	Rear Flue Plate	4.80	6.00	7.00	9.50	8.50	13.50
42	Right Flue Plate	1.60	2.00	2.60	2.60	3.50	4.20
43	Left Flue Plate	1.60	2.00	2.60	2.60	3.50	4.20
44	Smoke Collar	3.00	3.00	3.50	3.50	4.20	5.00
45	Cleanout Collar	1.20	1.20	1.20	1.20	1.20	1.20

900 Series "Perfect" Positive Circulating Furnaces

Shown with Steel Radiator

Illustrations and prices will serve as well for most parts of other types

90 Series, 1900 Series



When ordering parts kindly state:—

1. Name, Number and Letter if any, on Feed Door.
2. Whether Heater has Steel or Cast Radiator.
3. If Heater is set in Brick Work.
4. Whether Grate Bars are right or left hand; main (shaker) or short bars.

900 Series "Perfect" Positive Circulating Furnaces

(See illustration, page 8)

No.	Name of Part	LIST PRICES					
		900	901	902	904	906	908
46	Cleanout Galvd. Cap	$ .80	$ .80	$ .80	$ .80	$ .80	$ .80
47	Sheet Iron Drum	13.00	14.50	15.50	18.50	21.70	26.75
48	Sheet Iron Horseshoe	13.00	14.50	15.50	18.50	21.70	26.75
	CAST RADIATOR						
50	Radiator only	.....	108.50	129.00	164.00	184.00	233.00
51	Cleanout Plug	.....	.70	.70	.70	.70	.70
52	Cleanout Turnbuckle	.....	.20	.20	.20	.20	.20
53	Cleanout Galvd. Cap	.....	.80	.80	.80	.80	.80
54	Thimble (for smoke collar)	.....	2.00	2.00	2.00	3.00	3.00
55	Wings for Cast Rad.,(each)	.....	.....	.....	.....	.....	.....
56	Cast Rad. Supports, (each)	.....	2.00	2.30	2.30	2.60	3.00
	PANEL FRONT						
57	Panel Front only	12.00	14.50	14.50	14.50	14.50	24.50
58	Cleanout Door	2.40	2.40	2.40	2.40	2.40	2.40
59	Dust Door	1.20	1.20	1.20	1.20	1.20	1.20
60	Base Ring	4.50	5.50	6.40	7.50	7.70	13.00
61	Middle Ring	4.20	5.20	8.00	9.30	9.60	12.00
62	Top Ring	4.20	5.20	6.00	6.80	6.80	7.50
63	Poker	1.50	1.50	1.50	1.50	1.50	1.50

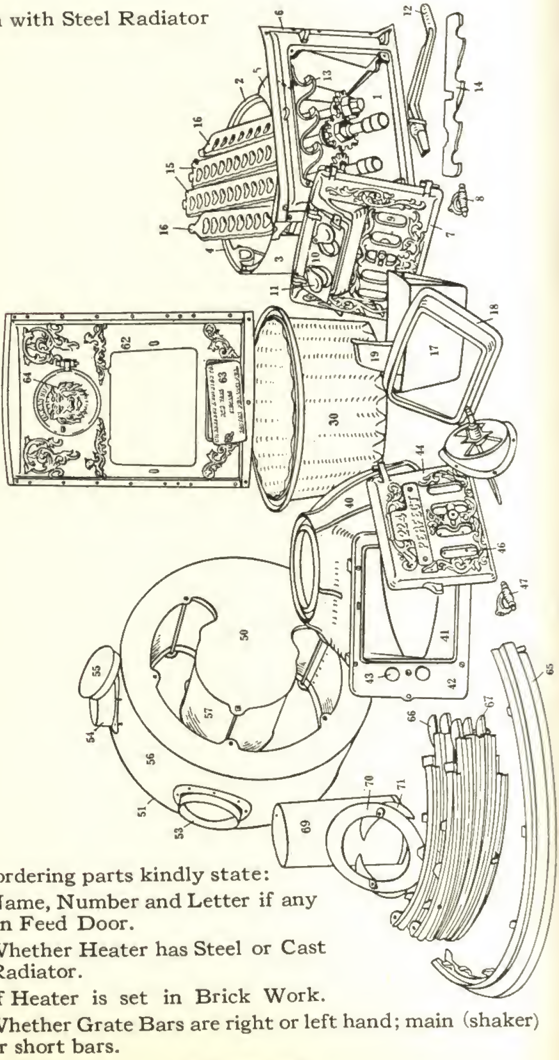
921, 991, 1921, 1931, 1991 Series

No.	Name of Part	LIST PRICES				
		921 991 1921 1991	922 992 1922 1992	924 994 1924 1994	926 996 1926 1996	928 998 1928 1998
26	Body	$32.75	$44.00	$47.25	$55.00	$82.00
29	Feed Door Frame	4.90	4.90	4.90	4.90	4.90
31–35	Feed Door and Linings complete	10.50	11.00	11.75	12.25	14.50

For other parts use 900 Series prices on pages 7 and 9

200 Series "Perfect" Warm Air Furnaces

Shown with Steel Radiator



When ordering parts kindly state:

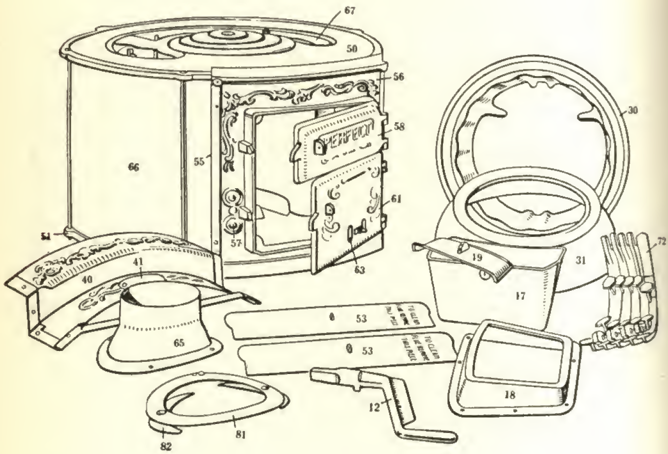
1. Name, Number and Letter if any on Feed Door.
2. Whether Heater has Steel or Cast Radiator.
3. If Heater is set in Brick Work.
4. Whether Grate Bars are right or left hand; main (shaker) or short bars.

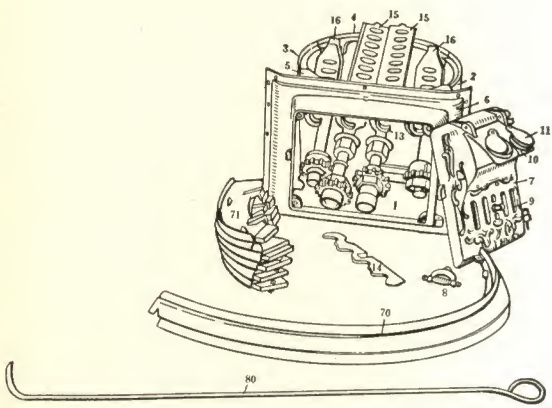
200 Series "Perfect" Furnaces

(See illustration, page 10)

No.	Name of Part	LIST PRICES						
		217	219	222	224	226	229	229-E
	BASE							
1	Bottom	$5.20	$6.50	$8.00	$11.50	$15.00	$14.80	$21.50
2	R Side	4.20	4.80	4.80	6.50	6.50	8.70	12.50
3	L Side	4.20	4.80	4.80	6.50	6.50	8.70	12.50
4	Back	2.90	3.90	5.20	6.10	6.10	8.70	12.50
5	Top	2.60	3.20	4.50	4.50	7.70	7.70	9.00
6	Frame	4.80	5.20	4.50	5.60	5.60	5.60	7.20
7	Door	8.00	7.20	6.80	8.40	8.40	9.60	9.60
8	Door Handle	.30	.30	.30	.30	.30	.30	.30
9	Door Slide	.80	.80	.50	.80	.80	.80	.80
10	Flap Door	1.00	1.00	1.50	1.50	1.50	1.50	2.00
11	Shaker Stopper	.20	.20	.20	.20	.20	.20	.20
12	Shaker	1.50	1.50	1.50	1.50	1.50	1.50	1.50
13 14	Front Grate Yoke Grate Yoke Clamp	1.50	2.20	2.50	3.00	3.40	3.40	5.20
15	Main Bar, R or L, (each)	2.50	4.40	4.70	6.00	8.00	8.00	12.50
16	Short Bar, R or L, (each)	1.70	3.00	3.60	4.40	5.50	5.20	9.60
17	Waterpan	5.20	5.20	5.20	5.20	5.20	6.00	
18	Waterpan Frame	2.00	2.00	2.00	2.00	2.00	2.00	
19	Waterpan Cover	.80	.80	.80	.80	.80	.80	
	FIREPOT							
30	One-piece	23.50	27.50	30.00	38.50	46.50	70.00	
31	Top Section 2 pc	.....	14.00	16.00	20.50	24.50	35.50	
32	Bottom Section 2 pc	.....	13.50	15.50	18.50	22.50	33.50	
	BODY							
40	Body only	20.00	20.00	27.00	38.50	58.00	53.00	
41	Lip	2.30	2.30	2.60	3.20	3.60	3.60	
42	Frame	3.20	3.20	3.20	3.20	3.20	3.20	
43	Frame Pipe Cover	.30	.30	.30	.30	.30	.30	
44	Feed Door and Lining	8.00	5.60	6.00	6.00	6.00	5.20	
45	Feed Door Lining	2.80	1.60	1.60	1.60	1.60	1.00	
46	Door Slide	.50	.50	.50	.50	.50	.50	
47	Door Handle	.30	.30	.30	.30	.30	.30	
	STEEL RADIATOR							
50	Top Plate	8.70	11.50	14.10	18.50	21.00	28.00	
51	Bottom Plate	8.00	9.30	12.00	15.50	18.00	24.50	
52	Rear Flue Plate	.....	.....	.....	.....	.....	.....	
53	Smoke Collar	1.30	1.30	1.30	1.60	1.60	1.60	
54	Cleanout Collar	1.20	1.20	1.60	2.00	2.00	2.90	
55	Cleanout Galvd. Cap	.80	.80	.80	.80	.80	.80	
56	Sheet Iron Drum	5.30	6.00	6.30	6.80	7.60	9.00	
57	Sheet Iron Horseshoe	5.30	6.00	6.30	6.80	7.60	9.00	
	CAST RADIATOR							
58	Cast Radiator only	.....	61.00	64.00	73.50	77.00	119.00	
59	Cleanout Plug	.....	.80	.80	.80	.80	.80	
60	Cleanout Turnbuckle	.....	.20	.20	.20	.20	.20	
61	Cleanout Galvd. Cap	.....	.80	.80	.80	.80	.80	
	PANEL FRONT							
62	Panel Front only	7.50	8.50	9.60	9.60	12.00	12.50	
63	Dust Door	1.20	1.20	1.20	1.20	1.20	1.20	
64	Cleanout Door	2.00	2.40	2.40	2.40	2.40	2.40	
65	Base Ring	3.90	5.20	4.80	5.50	6.90	7.40	
66	Middle Ring	4.20	3.50	3.90	4.50	5.00	6.80	
67	Top Ring	4.20	3.50	3.90	4.50	5.00	6.80	
68	Poker	1.50	1.50	1.50	1.50	1.50	1.50	
69	Smoke Collar Ext	2.60	3.20	3.50	3.50	4.50	4.80	
70 71	Finishing Ring Finishing Ring Clamps	1.20	1.20	1.20	1.20	1.60	1.60	

"Perfect" Low-Construction Furnaces





When ordering parts kindly state:—

1. Name, Number and Letter if any, on Feed Door.
2. Whether Grate Bars are right or left hand: main (shaker) or short bars.

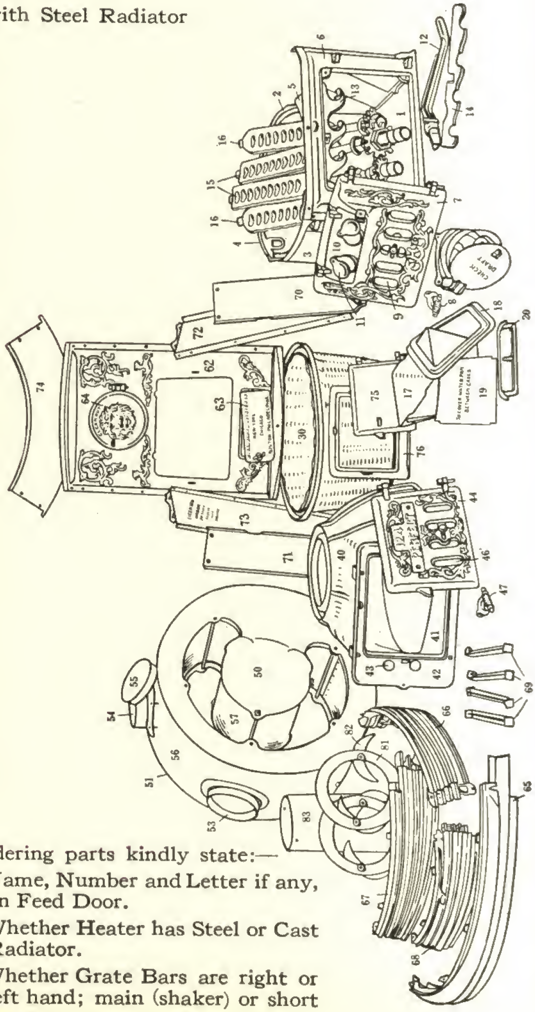
"Perfect" Low-Construction Furnaces

(See illustration, page 12)

No.	Name of Part	LIST PRICES 41	46	51	56
	BASE				
1	Bottom	$6.50	$8.00	$11.50	$15.00
2	R. Side	4.80	4.80	6.50	6.50
3	L. Side	4.80	4.80	6.50	6.50
4	Back	3.90	5.20	6.10	6.10
5	Top	3.20	4.50	4.50	7.70
6	Frame	5.20	4.50	5.60	5.60
7	Door Complete	7.20	6.80	8.40	8.40
8	Door Handle	.30	.30	.30	.30
9	Door Slide	.80	.50	.80	.80
10	Flap Door	1.00	1.50	1.50	1.50
11	Shaker Stopper	.20	.20	.20	.20
12	Shaker	1.50	1.50	1.50	1.50
13	Front Grate Yoke	2.20	2.50	3.00	3.40
14	Front Grate Yoke Clamp				
15	Main Bar, R or L, (each)	4.40	4.70	6.00	8.00
16	Short Bar, R or L, (each)	3.00	3.60	4.40	5.50
17	Waterpan	5.20	5.20	5.20	5.20
18	Waterpan Frame	1.60	1.60	1.60	1.60
19	Waterpan Cover	1.00	1.00	1.00	1.00
	FIREPOT				
30	Firepot One-piece	27.50	30.00	38.50	46.50
31	Pot Extension	9.60	11.20	14.50	16.00
	BODY				
50	Top Plate	25.00	36.50	32.50	45.00
51	Bottom Plate	22.00	30.00	41.50	42.50
52	Rear Flue Plate	2.00	2.30	3.20	3.50
53	R or L Flue Plate	1.60	2.00	2.90	2.90
54	Diaphragm Lugs	.....	.....	.....	.....
55	Mouthpiece	6.00	6.00	6.00	6.00
56	Feed Door Frame	10.00	10.00	11.60	12.40
57	Pipe Hole Cover	.30	.30	.30	.30
58	Upper Door				
59	Upper Door Lining				
60	Upper Door Handle				
61	Lower Door	11.50	11.50	11.50	11.50
62	Lower Door Lining				
63	Lower Door Slide				
64	Lower Door Handle				
65	Smoke Collar	2.00	2.60	2.60	2.60
66	Sheet Iron Drum	12.00	13.00	16.00	22.50
67	Sheet Iron Horseshoe	12.00	13.00	16.00	22.50
	PANEL FRONT				
40	Panel Front	6.40	6.40	7.00	8.40
41	Dust Door	.40	.40	.40	.40
70	Base Ring	4.50	4.80	5.20	6.80
71	Middle Ring	8.00	11.50	12.00	14.50
72	Top Ring	5.80	5.80	5.80	5.80
80	Poker	1.50	1.50	1.50	1.50

100 and 300 Series "Perfect" Pipeless Furnaces

Shown with Steel Radiator



When ordering parts kindly state:—

1. Name, Number and Letter if any, on Feed Door.
2. Whether Heater has Steel or Cast Radiator.
3. Whether Grate Bars are right or left hand; main (shaker) or short bars.

"Perfect" Pipeless Furnaces

(See illustration, page 14)

No.	Name of Part	LIST PRICES				
		117	119 319	122 322	124 324	126 326
	BASE					
1	Bottom	$5.20	$6.50	$8.00	$11.50	$15.00
2	R Side	4.20	4.80	4.80	6.50	6.50
3	L Side	4.20	4.80	4.80	6.50	6.50
4	Back	2.90	3.90	5.20	6.10	6.10
5	Top	2.60	3.20	4.50	4.50	7.70
6	Frame	4.80	5.20	4.50	5.60	5.60
7	Door	8.00	7.20	6.80	8.40	8.40
8	Door Handle	.30	.30	.30	.30	.30
9	Door Slide	.80	.80	.80	.80	.80
10	Flap Door	1.00	1.00	1.50	1.50	1.50
11	Shaker Stopper	.20	.20	.20	.20	.20
12	Shaker	1.50	1.50	1.50	1.50	1.50
13	Front Grate Yoke }	1.50	2.20	2.50	3.00	3.40
14	Grate Yoke Clamp }					
15	Main Bar, R or L, (each)	2.50	4.40	4.70	6.00	8.00
16	Short Bar, R or L, (each)	1.70	3.00	3.60	4.40	5.50
	FIREPOT					
30	One-piece	23.50	27.50	30.00	38.50	46.50
31	Top Section 2 pc	.....	14.00	16.00	20.50	24.50
32	Bottom Section 2 pc	.....	13.50	15.50	18.50	22.50
	BODY					
40	Body only	20.00	20.00	27.00	38.50	58.00
41	Lip	2.30	2.30	2.60	3.20	3.60
42	Frame	3.20	3.20	3.20	3.20	3.20
43	Frame Pipe Cover	.30	.30	.30	.30	.30
44	Feed Door }	8.00	5.60	6.00	6.00	6.00
45	Feed Door Lining }					
46	Door Slide }					
47	Door Handle	.30	.30	.30	.30	.30
	STEEL RADIATOR					
50	Top Plate	8.70	11.50	14.10	18.50	21.00
51	Bottom Plate	8.00	9.30	12.00	15.50	18.00
53	Smoke Collar	1.30	1.30	1.30	1.60	1.60
54	Cleanout Collar	1.20	1.20	1.60	2.00	2.00
55	Cleanout Galvd. Cap	.80	.80	.80	.80	.80
56	Sheet Iron Drum	5.30	6.00	6.30	6.80	7.60
57	Sheet Iron Horseshoe	5.30	6.00	6.30	6.80	7.60
	CAST RADIATOR					
58	Cast Radiator only	....	61.00	64.00	73.50	77.00
59	Cleanout Plug	.70	.70	.70	.70	.70
60	Cleanout Turnbuckle	.20	.20	.20	.20	.20
61	Cleanout Galvd. Cap	.80	.80	.80	.80	.80
	PANEL FRONT					
62	Panel Front only	7.50	8.50	9.60	9.60	12.00
63	Dust Door	1.20	1.20	1.20	1.20	1.20
64	Cleanout Door	2.00	2.40	2.40	2.40	2.40

"Perfect" Pipeless Furnaces

(See illustration, page 14)

No.	Name of Part	LIST PRICES				
		117	119 319	122 322	124 324	126 326
17	Waterpan	$3.50	$3.50	$3.50	$3.50	$3.50
18	Waterpan Frame	.80	.80	.80	.80	.80
19	Inner Cover	.80	.80	.80	.80	.80
20	Outer Cover	.40	.40	.40	.40	.40
65	Base Ring	5.20	6.40	6.10	7.80	9.40
66	Outer Middle Ring	4.80	5.20	5.20	7.00	7.50
67	Outer Top Ring	4.80	5.20	5.20	7.00	7.50
68	Bottom Inner Ring	4.20	3.50	3.90	5.00	5.00
69	Bottom Inner Ring Legs, (each)	.40	.40	.40	.40	.40
70	Extension Panel R. Bottom	2.60	2.90	2.60	2.90	2.90
71	Extension Panel L. Bottom	2.60	2.90	2.60	2.90	2.90
72	Extension Panel R. Middle	3.50	3.20	3.50	3.90	3.90
73	Extension Panel L. Middle	3.50	3.20	3.50	3.90	3.90
74	Extension Panel Top	3.20	2.60	3.90	3.90	5.20
75	Cleanout Door	1.60	1.60	1.60	1.60	1.60
76	Cleanout Door Frame	1.60	1.60	1.60	1.60	1.60
	REGISTER					
77	Black (117—126 only)	12.00	14.00	16.00	18.00	22.00
78	Nickel	.....	.....	.....	.....	.....
79	Oxidized	.....	.....	.....	.....	.....
80	Brass	.....	.....	.....	.....	.....
81	Finishing Ring	1.20	1.20	1.20	1.20	1.60
82	Finishing Ring Clamp, (each)					
83	Smoke Collar Extension	4.20	6.00	6.00	6.00	6.40

300 Series "Perfect" Furnaces

(See illustration, page 8)

No.	Name of Part	LIST PRICES 349—349-1 349-2—349-3 449	353—353-1 353-2—353-3 453	357—357-1 357-2—357-3 457	363—363-1 363-2—363-3 463	374—374-1 374-2—374-3 474
	BASE					
1	Bottom	$10.00	$11.00	$15.00	$21.50	$28.00
2	R Side	6.00	7.00	9.00	12.50	13.50
3	L Side	6.00	7.00	9.00	12.50	13.50
4	Back	5.00	7.00	7.00	12.50	12.50
5	Top	4.50	5.50	7.50	9.00	14.50
6	Frame	6.00	6.00	6.00	6.00	10.80
7	Door	9.00	9.60	10.00	11.60	16.00
8	Door Handle	.30	.30	.30	.30	.30
9	Door Slide	.80	1.20	1.20	1.60	1.60
10	Flap Door	1.60	1.60	2.00	2.50	2.50
11	Shaker Stopper	.20	.20	.20	.20	.20
12	Shaker	1.50	1.50	1.50	1.50	2.20
13	Front Grate Yoke	1.70	1.70	3.00	5.10	5.70
14	Grate Yoke Clamp	.70	.90	1.50	5.10	2.30
15	Main Bar, R or L (each)	5.80	7.90	11.00	12.50	21.00
16	Short Bar, R or L (each)	4.40	5.80	8.20	9.60	16.00
17	Waterpan	6.75	6.75	6.75	6.75	6.75
18	Waterpan Frame	2.00	2.00	2.00	2.00	2.00
19	Waterpan Cover	.80	.80	.80	.80	.80
20	S. I. Dust Pipe	1.00	1.00	1.00	1.00	1.00
21	Dust Damper					
22	Dust Damper Spindle	.70	.70	.70	.70	.70
23	Dust Damper Handle					
	FIREPOT					
24	One-Piece Firepot	41.50	42.50	47.00	70.00	85.00
	BODY					
26	Body Only	45.00	50.00	72.00	87.00	131.00
28	Lip	3.20	4.20	5.00	5.00	6.50
29	Frame	6.50	6.50	6.50	6.50	6.50
30	Frame Pipe Cover	.40	.40	.40	.40	.40
31	Upper Door					
32	Upper Door Lining					
33	Lower Door	10.50	10.50	10.50	10.50	10.50
34	Lower Door Lining					
35	Door Slide					
36	Door Handle	.30	.30	.30	.30	.30
	CAST RADIATOR					
50	Radiator Only	76.00	95.00	109.00	131.00	187.00
51	Cleanout Plug	.70	.70	.70	.70	.70
52	Cleanout Turnbuckle	.20	.20	.20	.20	.20
53	Cleanout Galvd. Cap	.80	.80	.80	.80	.80
54	Thimble (For Smoke Collar)	2.60	2.60	4.00	4.00	4.00
	Back Cast Smoke Tee	5.00	5.00	6.50	6.50	6.80
	Perforated Damper	1.20	1.20	1.20	1.20	1.50
	PANEL FRONT					
57	Panel Front Only	11.50	13.50	13.50	13.50	18.00
58	Cleanout Door	2.40	2.40	2.40	2.40	2.40
59	Dust Door	1.20	1.20	1.20	1.20	1.20
60	Base Ring	5.00	5.80	6.80	7.00	7.70
61	Middle Ring	4.50	5.00	5.80	6.80	8.30
62	Top Ring	4.50	5.00	5.80	6.80	8.30
63	Poker	1.50	1.50	1.50	1.50	1.50

100 Series "Perfect" Furnaces

(See illustration, page 8)

No.	Name of Part	LIST PRICES							
		131	135	141	144	148	157	163	171
	BASE								
1	Bottom	$6.50	$7.00	$10.00	$11.00	$15.00	$21.50	$28.00	$44.50
2	R Side	.....	4.50	6.00	7.00	9.00	12.50	13.50	20.50
3	L Side	.....	4.50	6.00	7.00	9.00	12.50	13.50	20.50
4	Back	.....	4.50	5.00	7.00	7.00	12.50	11.50	22.00
5	Top	12.00	3.50	4.50	5.50	7.50	9.00	14.50	19.00
6	Frame	6.00	6.00	7.20	7.20	7.20	7.20	10.80	13.60
7	Door, each	6.00	6.00	8.00	8.00	8.00	9.60	16.00	9.20
8	Door Handle	.30	.30	.30	.30	.30	.30	.30	.30
9	Door Slide, each	.50	.50	.70	.70	.70	.70	1.60	1.20
10	Flap Door, each	1.40	1.40	1.60	1.60	1.60	2.00	2.50	1.60
11	Shaker Stopper	.20	.20	.20	.20	.20	.20	.20	.20
12	Shaker	1.50	1.50	1.50	1.50	1.50	1.50	2.20	2.20
13 14	Front Grate Yoke Grate Yoke Clamp	1.50	2.00	1.70	2.50	4.00	5.20	8.00	10.00
15	Main Bar, R or L, each	2.50	4.90	5.80	7.90	11.00	12.50	21.00	16.00
16	Short Bar, R or L, each	1.70	3.30	4.40	5.80	8.20	9.60	16.00	10.70
17	Waterpan	6.75	6.75	6.75	6.75	6.75	6.75	6.75	6.75
18	Waterpan Frame	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
19	Waterpan Cover	.80	.80	.80	.80	.80	.80	.80	.80
	FIREPOT								
30	One-Piece	22.50	34.00	41.50	42.50	56.00	70.00	85.00	109.00
31	Top Section, 2 pc	.....	.....	.....	.....	.....	.....	.....	.....
32	Bottom Section, 2 pc	.....	.....	.....	.....	.....	.....	.....	.....
	BODY								
40	Body Only	13.00	20.00	24.00	32.00	35.50	43.50	57.00	129.00
41	Lip	.....	2.60	3.60	4.00	4.00	4.00	4.50	8.00
42	Frame	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.50
43	Frame Pipe Cover	.30	.30	.30	.30	.30	.30	.30	.30
44	Feed Door and Lining	3.20	4.80	5.20	5.20	5.20	5.20	5.60	9.20
45	Feed Door Lining	1.20	2.00	2.00	1.20	1.20	1.20	1.60	2.80
46	Door Slide	.40	.40	.40	.40	.40	.40	.40	.40
47	Door Handle	.30	.30	.30	.30	.30	.30	.30	.30
	STEEL RADIATOR								
50	Top Plate	9.00	14.00	17.00	23.00	24.50	32.00	44.00	83.00
51	Bottom Plate	7.50	12.00	17.00	19.00	21.50	29.00	34.00	59.00
53	Smoke Collar	3.00	2.60	3.00	3.00	3.50	4.20	4.20	5.00
54	Cleanout Collar	1.30	1.30	1.30	1.30	1.30	1.30	1.30	1.30
55	Cleanout Galvd. Cap	.80	.80	.80	.80	.80	.80	.80	.80
56	Sheet Iron Drum	9.50	10.60	11.70	12.50	15.00	16.50	19.00	.....
57	Sheet Iron Horseshoe	9.50	10.60	11.70	12.50	15.00	16.50	19.00	.....
	CAST RADIATOR								
58	Cast Radiator Only	.....	.....	76.00	95.00	109.00	131.00	187.00	.....
59	Cleanout Plug	.....	.....	.70	.70	.70	.70	.70	.....
60	Cleanout Turnbuckle	.....	.....	.20	.20	.20	.20	.20	.....
61	Cleanout Galvd. Cap	.....	.....	.80	.80	.80	.80	.80	.....
..	Smoke Thimble	.....	.....	2.60	2.60	4.00	4.00	4.00	.....
	PANEL FRONT								
62	Panel Front Only	9.00	11.00	13.00	13.00	16.00	14.00	21.00	29.00
63	Dust Door	1.60	2.40	2.40	2.40	2.40	2.40	2.00	1.20
64	Cleanout Door	1.60	1.60	1.60	1.60	2.00	2.40	2.00	2.00
65	Base Ring	4.20	4.20	4.80	6.50	5.80	7.40	7.70	7.70
66	Middle Ring	3.90	4.20	4.20	5.80	5.00	6.80	8.40	7.40
67	Top Ring	3.90	4.20	4.20	5.80	5.00	6.80	8.40	7.40
68	Poker	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50
..	Body Ext. for Cast. Radr.	.....	.....	6.00	7.25	9.50	8.50	12.00	...

1000 and 1100 Series "Progressive" Furnaces

(See illustration, page 10)

No.	Name of Part	LIST PRICES					
		1028 1028A 1028C 1028E	1032 1032A 1032C 1032E 1032X 1132	1036 1036A 1036C 1036E 1036X 1136	1040 1040A 1040C 1040E 1040X 1140	1044 1044A 1044C 1044E 1044X 1144	1050 1050A 1050C 1050E 1050X 1150
	BASE						
1	Bottom	$5.00	$6.00	$7.50	$10.00	$11.50	$17.50
2	R Side	3.90	4.80	5.50	7.00	7.70	8.00
3	L Side	3.90	4.80	5.50	7.00	7.70	8.00
4	Back	3.90	4.20	4.20	6.80	8.50	9.60
5	Top	3.20	3.50	3.50	5.50	6.50	7.70
6	Frame	5.20	6.40	6.80	7.00	7.00	8.50
7	Door	6.40	7.60	8.50	9.20	9.20	10.00
8	Door Handle	.30	.30	.30	.30	.30	.30
9	Door Slide	.50	.50	.80	1.20	1.20	1.70
10	Flap Door	1.00	1.40	1.40	1.70	1.70	1.70
11	Shaker Stopper	.20	.20	.20	.20	.20	.20
12	Shaker	1.50	1.50	1.50	1.50	1.50	1.50
13	Front Grate Yoke	1.70	1.70	2.00	2.40	2.60	3.10
14	Grate Yoke Clamp						
15	Main Bar, R or L, each "A" Pattern	2.50	3.90	4.10	5.00	5.50	8.00
16	Short Bar, R or L, each " "	1.70	2.80	2.50	3.30	3.90	5.20
..	"E" Main Grate Bar	2.80	3.60	5.00	6.00	8.20	9.60
..	"E" Short Grate Bar	1.90	2.50	3.30	4.40	6.00	6.60
17	Waterpan	6.75	6.75	6.75	6.75	6.75	6.75
18	Waterpan Frame	2.00	2.00	2.00	2.00	2.00	2.00
19	Waterpan Cover	.80	.80	.80	.80	.80	.80
	FIREPOT						
30	One-Piece	22.50	39.00	39.00	42.00	50.00	73.00
	BODY						
40	Body Only	16.50	20.00	23.00	28.50	34.50	48.50
41	Lip	2.30	2.60	2.90	3.50	3.80	4.80
42	Frame	3.00	3.00	3.20	3.20	3.20	3.20
43	Frame Pipe Cover	.30	.30	.30	.30	.30	.30
44	Feed Door and Lining	4.00	4.00	4.00	4.00	4.00	5.20
45	Feed Door Lining	1.20	1.20	1.20	1.20	1.20	1.20
46	Door Slide	.40	.40	.40	.40	.40	.40
47	Door Handle	.30	.30	.30	.30	.30	.30
	STEEL RADIATOR						
50	Top Plate	8.70	11.50	14.10	18.50	21.00	28.00
51	Bottom Plate	8.00	9.30	12.00	15.50	18.00	24.50
53	Smoke Collar	1.30	1.30	1.30	1.60	1.60	1.60
54	Cleanout Collar	1.20	1.20	1.60	2.00	2.00	2.90
55	Cleanout Galvd. Cap	.80	.80	.80	.80	.80	.80
56	Sheet Iron Drum	5.30	6.00	6.30	6.80	7.60	9.00
57	Sheet Iron Horseshoe	5.30	6.00	6.30	6.80	7.60	9.00
	CAST RADIATOR						
58	Cast Radiator Only	....	61.00	64.00	73.50	77.00	119.00
59	Cleanout Plug	....	.80	.80	.80	.80	.80
60	Cleanout Turnbuckle	....	.20	.20	.20	.20	.20
61	Cleanout Galvd. Cap	....	.80	.80	.80	.80	.80
..	Smoke Thimble	....	3.20	3.50	3.50	4.50	4.80
	PANEL FRONT						
62	Panel Front Only	6.00	6.50	8.00	11.00	11.00	12.50
63	Dust Door	1.20	1.20	1.20	1.20	1.20	1.20
64	Cleanout Door	2.40	2.40	2.40	2.40	2.40	2.40
65	Base Ring	4.20	4.50	4.80	5.80	6.80	7.50
66	Middle Ring	3.90	4.00	4.50	4.80	5.80	6.80
67	Top Ring	3.90	4.00	4.50	4.80	5.80	6.80
68	Poker	....	....	....	....	....	....

4000 and 4100 Series "Progressive" Furnaces

(See illustration, page 10)

No.	Name of Part	LIST PRICES					
		4028	4032 4032x 4132	4036 4036x 4136	4040 4040x 4140	4044 4044x 4144	4050 4050x 4150
	BASE						
1	Bottom	$5.00	$6.00	$7.50	$10.00	$11.50	$17.50
2	R Side	3.90	4.80	5.50	7.00	7.70	8.00
3	L Side	3.90	4.80	5.50	7.00	7.70	8.00
4	Back	3.90	4.20	4.20	6.80	8.50	9.60
5	Top	3.20	3.50	3.50	5.50	6.50	7.70
6	Frame	5.20	6.40	6.80	7.00	7.00	8.50
7	Door	6.40	7.60	8.50	9.20	9.20	10.00
8	Door Handle	.30	.30	.30	.30	.30	.30
9	Door Slide	.50	.50	.80	1.20	1.20	1.70
10	Flap Door	1.00	1.40	1.40	1.70	1.70	1.70
11	Shaker Stopper	.20	.20	.20	.20	.20	.20
12	Shaker	1.50	1.50	1.50	1.50	1.50	1.50
13 14	Front Grate Yoke Grate Yoke Clamp	1.70	1.70	2.00	2.40	2.60	3.10
15	Main Bar, R or L, each "E" Pattern	2.80	3.60	5.00	6.00	8.20	9.60
16	Short Bar, R or L, each " "	1.90	2.50	3.30	4.40	6.00	6.60
	Main Bar "A" Pattern, 4132 Series	....	3.90	4.10	5.00	5.50	8.00
	Short " " " " "	....	2.80	2.50	3.30	3.90	5.20
17	Waterpan	6.75	6.75	6.75	6.75	6.75	6.75
18	Waterpan Frame	2.00	2.00	2.00	2.00	2.00	2.00
19	Waterpan Cover	.80	.80	.80	.80	.80	.80
	Wood Plate	....	2.50	3.30	5.50	7.00	7.00
	FIREPOT						
30	One-Piece	22.50	39.00	39.00	42.00	50.00	73.00
	BODY						
40	Body Only	20.00	23.00	34.00	39.00	54.50	54.50
41	Lip	2.30	2.60	2.90	3.50	3.80	4.80
42	Frame	3.60	3.60	3.60	3.60	3.60	3.60
43	Frame Pipe Cover	.30	.30	.30	.30	.30	.30
44	Feed Door and Lining	8.00	8.00	8.00	8.00	8.00	8.00
45	Feed Door Lining	2.80	2.80	2.80	2.80	2.80	2.80
46	Door Slide	.40	.40	.40	.40	.40	.40
47	Door Handle	.30	.30	.30	.30	.30	.30
	STEEL RADIATOR						
50	Top Plate	8.70	11.50	14.10	18.50	21.00	28.00
51	Bottom Plate	8.00	9.30	12.00	15.50	18.00	24.50
53	Smoke Collar	1.30	1.30	1.30	1.60	1.60	1.60
54	Cleanout Collar	1.20	1.20	1.60	2.00	2.00	2.90
55	Cleanout Galvd. Cap	.80	.80	.80	.80	.80	.80
56	Sheet Iron Drum	5.30	6.00	6.30	6.80	7.60	9.00
57	Sheet Iron Horseshoe	5.30	6.00	6.30	6.80	7.60	9.00
	CAST RADIATOR						
58	Cast Radiator Only	....	61.00	64.00	73.50	77.00	119.00
59	Cleanout Plug	....	.80	.80	.80	.80	.80
60	Cleanout Turnbuckle	....	.20	.20	.20	.20	.20
61	Cleanout Galvd. Cap	....	.80	.80	.80	.80	.80
	Smoke Thimble	....	3.20	3.50	3.50	4.50	4.80
	PANEL FRONT						
62	Panel Front Only	5.50	7.00	8.50	9.00	11.50	12.50
63	Dust Door	1.20	1.20	1.20	1.20	1.20	1.20
64	Cleanout Door	2.40	2.40	2.40	2.40	2.40	2.40
65	Base Ring	4.20	4.50	4.80	5.80	6.80	7.50
66	Middle Ring	3.90	4.00	4.50	4.80	5.80	6.80
67	Top Ring	3.90	4.00	4.50	4.80	5.80	6.80
68	Poker	1.50	1.50	1.50	1.50	1.50	1.50

Calorific Series Furnaces

(See illustration, page 12)

No	Name of Part	LIST PRICES				
		818	821	824	827	830
	Grate Bars—Set	$21.40	$28.00	$32.00	$46.00	$55.00
	Main	6.30	8.20	9.00	13.40	.....
	(No. 2)	.....	.....	.....	.....	10.00
	(No. 4)	.....	.....	.....	.....	10.60
	(No. 5)	.....	.....	.....	.....	10.00
	Short	4.40	5.80	7.00	9.60	.....
	(No. 1)	.....	.....	.....	.....	7.40
	(No. 3)	.....	.....	.....	.....	9.60
	(No. 6)	.....	.....	.....	.....	7.40
	Pot	41.00	48.50	59.50	70.00	74.50
	BASE					
1	Bottom Plate	13.00	16.70	17.30	22.50	30.00
2	R Side	6.50	9.00	10.60	13.00	13.00
3	L Side	6.50	9.00	10.60	13.00	13.00
4	Back	7.40	7.40	8.40	10.30	14.50
5	Top	5.50	7.70	9.30	13.00	16.00
6	Frame	7.60	7.60	8.50	8.50	10.50
7	Door Complete	8.00	8.00	8.00	8.00	14.50
9	Door Slide	.60	.60	.60	.60	1.20
10	Flap Door	2.00	2.00	2.50	2.50	4.00
12	Shaker	1.50	1.50	1.50	1.50	2.20
13	Upper Grate Yoke	1.40	2.50	3.30	2.80	4.70
13	Lower Grate Yoke, R or L., each	1.10	.60	.90	1.40	.90
17	Lower Middle Grate Yoke	.....	.....	.....	.....	1.10
	BODY					
21	Dust Flue & Damper	1.50	1.50	1.50	1.50	1.50
23	Dust Damper & Rod	.70	.70	.70	.70	.70
50	Top Plate	28.00	34.50	43.00	64.00	75.00
51	Bottom Plate-Less Lip	20.00	29.00	29.00	35.00	45.00
55	Mouth Piece Only	5.00	5.00	6.00	5.00	5.00
58	Feed Door & Lining	12.00	12.00	12.00	12.00	12.00
59	Feed Door Lining	4.00	4.00	4.00	4.00	4.00
65	Smoke Collar, each	2.30	2.30	2.30	2.30	2.30
66	Shell	36.80	38.00	40.60	46.00	46.50
	Body Lip	4.50	5.50	5.80	7.40	8.70
	Tubes, each	16.00	19.50	22.50	22.50	27.00
	Feed Door Frame	5.60	5.60	5.60	5.60	5.60
	C. O. Door, each	2.40	2.40	2.40	2.40	2.40
	C. O. Door Frame, each	2.40	2.40	2.40	2.40	2.40
	Packing Rings, each	.70	.70	.70	.70	1.00
	Flue Strips, each	1.30	1.60	1.60	1.60	1.60
	Front Strip, R or L	3.00	3.00	3.00	3.00	4.20
	Diaphragm	4.80	7.00	8.40	8.70	15.50
	Legs, each	2.00	2.00	2.00	2.00	2.00
	C. O. Collar, each	2.30	2.30	2.30	2.30	2.30
	C. O. Cap	1.00	1.00	1.00	1.00	1.00
	PANEL FRONT					
39	Panel Front Only	9.60	11.50	12.50	12.50	18.50
40	Dust Door	1.20	1.20	1.20	1.20	1.20
41	Base Ring	6.70	7.00	9.00	11.00	12.00
42	Middle Ring	6.00	6.70	6.70	7.70	8.40
43	Top Ring	6.00	6.70	6.70	7.70	8.40
44	Galv. Back Pipe	11.00	11.00	11.00	11.00	11.00

"Perfect"
Low-Construction Furnaces

(See illustration, page 12)

No.	Name of Part	LIST PRICES			
		15	17	19	21
	BASE				
1	Bottom	$7.00	$8.00	$10.50	$13.80
2	R. Side	5.20	6.00	6.40	6.70
3	L. Side	5.20	6.00	6.40	6.70
4	Back	4.80	6.70	8.00	8.00
5	Top	3.50	3.90	4.50	6.00
6	Frame	6.00	6.00	6.00	6.00
7	Door Complete	6.50	7.00	8.00	8.00
8	Door Handle	.20	.20	.20	.20
9	Door Slide	.50	.80	1.20	1.20
10	Flap Door	1.60	1.60	2.20	2.20
11	Shaker Stopper	.20	.20	.20	.20
12	Shaker	1.50	1.50	1.50	1.50
13	Front Grate Yoke	1.70	1.70	2.50	4.10
14	Front Grate Yoke Clamp				
15	Main Bar, R or L (each)	4.90	5.80	7.90	11.00
16	Short Bar, R or L (each)	3.30	4.40	5.80	8.20
17	Waterpan	5.20	5.20	5.20	5.20
18	Waterpan Frame	2.00	2.00	2.00	2.00
19	Waterpan Cover	.80	.80	.80	.80
	FIREPOT				
30	Firepot Top Section	10.50	13.00	18.00	19.70
	Bottom Section	11.00	12.00	12.00	16.50
31	Pot Extension	9.00	10.20	14.80	18.00
	BODY				
50	Top Plate	23.50	33.50	39.00	44.50
51	Bottom Plate	21.50	29.00	33.50	39.00
53	R or L Flue Plate	6.00	6.00	6.00	6.00
54	Diaphragm Plates, set	4.50	5.80	9.00	9.00
55	Mouth Piece	6.00	6.00	6.00	6.00
56	Feed Door Frame	9.00	9.00	10.50	11.20
57	Pipe Hole Cover	.30	.30	.30	.30
58	Upper Door				
59	Upper Door Lining				
60	Upper Door Handle				
61	Lower Door	11.50	11.50	11.50	11.50
62	Lower Door Lining				
63	Lower Door Slide				
64	Lower Door Handle				
65	Smoke Collar	2.00	2.20	2.20	2.60
66	Sheet Iron Drum	12.00	13.00	16.00	22.50
67	Sheet Iron Horseshoe	12.00	13.00	16.00	22.50
	PANEL FRONT				
40	Panel Front	5.00	5.20	5.80	6.50
	Direct Draft Connection	5.20	6.00	7.70	7.70
	Wood Plates	2.50	4.00	5.50	7.00
41	Dust Door	1.20	1.20	1.20	1.20
70	Base Ring	4.50	5.20	5.20	6.00
71	Middle Ring	8.00	11.00	11.50	11.50
72	Top Ring	5.80	6.50	6.50	6.50
80	Poker	1.50	1.50	1.50	1.50

"Popular" Series Furnaces

(See illustration, page 12)

No.	Name of Part	LIST PRICES		
		5	7	9
	BASE			
1	Bottom	$7.00	$8.00	$10.50
2	R. Side	5.20	6.00	6.40
3	L. Side	5.20	6.00	6.40
4	Back	4.80	6.70	8.00
5	Top	3.50	3.90	4.50
6	Frame	6.00	6.00	6.00
7	Door Complete	6.50	7.00	8.50
10	Flap Door	1.60	1.60	2.40
9	Door Slide	.50	.80	1.20
13	Front Yoke Complete	1.70	1.70	2.50
12	Shaker	1.50	1.50	1.50
	Wood Plates	2.50	4.00	5.50
15	Main Bar, R or L	4.90	5.80	7.90
16	Short Bar, R or L	3.30	4.40	5.80
17	Waterpan	6.75	6.75	6.75
18	Waterpan Frame	2.00	2.00	2.00
19	Waterpan Cover	.80	.80	.80
	FIREPOT			
	Firepot—Top Section	10.50	13.00	18.00
	Bottom Section	11.00	12.00	12.00
31	Pot Extension	9.00	10.20	14.80
	BODY			
50	Top Plate	15.70	20.50	26.30
51	Bottom Plate	12.50	16.50	19.00
55	Mouth Piece	5.20	5.20	5.20
66&67	Radr. Sheet Iron Work	24.00	26.00	32.00
61	Feed Door and Lining	11.50	11.50	11.50
56	Feed Door Frame	11.00	11.00	11.00
62	Feed Door Lining	4.40	4.40	4.40
65	Smoke Collar	2.00	2.20	2.20
	PANEL FRONT			
40	Panel Front	4.00	4.20	4.50
41	Dust Door	1.20	1.20	1.20
70	Base Ring	4.50	5.20	5.20
71	Middle Ring	5.00	6.50	8.00
72	Top Ring	5.00	6.50	8.00
	Dust Flue and Damper	1.50	1.50	1.50
	Dust Damper and Rod	.70	.70	.70

"Success" Series Furnaces

(See illustration, page 10)

No.	Name of Part	LIST PRICES					
		2-E	4-E	61	81	101	121
	BASE						
1	Bottom	$5.20	$6.00	$8.00	$10.60	$14.00	$17.50
2	R Side	4.00	5.20	6.00	6.40	6.70	9.30
3	L Side	4.00	5.20	6.00	6.40	6.70	9.30
4	Back	4.00	4.20	6.70	8.00	8.00	8.40
5	Top	3.20	3.50	4.00	4.50	6.00	6.70
6	Frame	5.20	6.50	6.80	7.20	7.20	8.40
7	Door	6.50	7.60	9.00	10.00	10.00	11.20
8	Door Handle	.30	.30	.30	.30	.30	.30
9	Door Slide	.50	.50	.80	1.20	1.20	1.70
10	Flap Door	1.20	1.20	1.60	1.60	1.60	2.00
11	Shaker Stopper	.20	.20	.20	.20	.20	.20
12	Shaker	1.50	1.50	1.50	1.50	1.50	1.50
13	Front Grate Yoke }	1.70	1.70	2.00	2.60	4.50	4.90
14	Grate Yoke Clamp }						
15	Main Bar, R or L (each)	2.80	3.60	5.80	7.90	11.00	12.50
16	Short Bar, R or L (each)	1.90	2.50	4.40	5.80	8.20	9.60
17	Waterpan	6.75	6.75	6.75	6.75	6.75	6.75
18	Waterpan Frame	2.00	2.00	2.00	2.00	2.00	2.00
19	Waterpan Cover	.80	.80	.80	.80	.80	.80
20	Sheet Iron Dust Pipe only	1.00	1.00	1.00	1.00	1.00	1.00
22	Dust Damper and Handle	.70	.70	.70	.70	.70	.70
	FIREPOT						
30	One-Piece	22.50	39.00	41.50	42.50	47.00	70.00
	BODY						
40	Body Only	22.00	26.50	27.50	40.00	55.00	61.00
41	Lip	2.00	2.00	2.60	3.50	3.50	4.80
42	Frame	2.00	2.00	3.60	3.60	3.60	3.60
43	Frame Pipe Cover	.30	.30	.30	.30	.30	.30
44	Feed Door & Lining	3.60	4.50	5.00	5.00	5.00	5.00
45	Feed Door Lining	1.20	1.20	1.20	1.20	1.20	1.20
46	Door Slide	.40	.40	.40	.40	.40	.40
47	Door Handle	.30	.30	.30	.30	.30	.30
	Packing Ring	.80	.80	1.20	1.20	1.20	1.60
	STEEL RADIATOR						
50	Top Plate	5.50	7.70	8.40	12.00	17.00	22.00
51	Bottom Plate	6.40	8.40	10.30	15.50	17.60	22.00
	Diaphragm Plates	6.40	6.70	8.80	11.50	13.80	16.80
53	Smoke Collar	1.00	1.00	2.60	2.60	2.60	2.90
54	Cleanout Collar	1.00	1.00	1.00	1.00	1.00	2.00
55	Cleanout Galvd. Cap	.80	.80	.80	.80	.80	.80
56	Sheet Iron Outside Shell	6.00	7.00	7.00	8.00	8.60	10.00
57	Sheet Iron Inside Shell	6.00	7.00	7.00	8.00	8.60	10.00
	Front Radiator Rest	.40	.40	.40	.40	1.30	1.30
	PANEL FRONT						
62	Panel Front Only	6.80	7.70	9.00	9.00	12.00	13.00
63	Dust Door	1.20	1.20	1.20	1.20	1.20	1.20
64	Cleanout Door	2.40	2.40	2.40	2.40	2.40	2.40
65	Base Ring	3.90	4.20	4.50	4.80	5.80	6.70
66	Middle Ring	3.90	3.90	3.90	4.50	4.80	5.80
67	Top Ring	3.90	3.90	3.90	4.50	4.80	5.80
68	Poker	1.50	1.50	1.50	1.50	1.50	1.50
	Panel Front Extension	1.60	1.60	2.30	2.60	3.20	3.90

200 Series "Perfect" Furnaces

(See illustration, page 12)

No.	Name of Part	LIST PRICES				
		248	252	256	262	272-E
	BASE					
1	Bottom	$8.00	$10.60	$14.00	$17.50	$21.50
2	R Side	6.00	6.40	6.70	9.30	12.00
3	L Side	6.00	6.40	6.70	9.30	12.00
4	Back	6.70	7.50	7.50	8.40	11.20
5	Top	4.00	4.50	6.00	6.70	15.50
6	Frame	6.80	7.00	7.00	8.40	10.40
7	Door Complete	9.00	10.00	10.00	11.20	16.00
8	Door Handle	.30	.30	.30	.30	.30
9	Door Slide	.80	1.20	1.20	1.70	1.70
10	Flap Door	1.60	1.60	1.60	2.00	2.40
11	Shaker Stopper	.20	.20	.20	.20	.20
12	Shaker	1.50	1.50	1.50	1.50	2.20
13	Front Grate Yoke	1.70	1.70	3.00	4.90 (13 and 14)	5.70
14	Front Grate Yoke Clamp	.70	.90	1.50		2.30
15	Main Bar, R or L (each)	5.80	7.90	11.00	12.50	21.00
16	Short Bar, R or L (each)	4.40	5.80	8.20	9.60	16.00
17	Waterpan	6.75	6.75	6.75	6.75	6.75
18	Waterpan Frame	2.00	2.00	2.00	2.00	2.00
19	Waterpan Cover	.80	.80	.80	.80	.80
	Wood Plates	3.60	4.10	6.90	9.30	11.00
	FIREPOT					
30	Firepot One-Piece	41.50	42.50	47.00	70.00	85.00
31	Pot Extension	16.70	19.20	24.00	31.00	37.00
	BODY					
50	Top Plate	21.80	27.50	34.00	40.70	75.50
51	Bottom Plate	19.00	22.00	25.30	29.00	49.00
55	Mouthpiece	7.30	7.40	9.00	10.00	10.00
56	Feed Door Frame	5.75	5.75	5.75	5.75	6.00
57	Pipe Hole Cover	.30	.30	.30	.30	.30
58	Upper Door	11.50 (58 to 64)	11.50 (58 to 64)	11.50 (58 to 64)	11.50 (58 to 64)	11.50 (58 to 64)
59	Upper Door Lining					
60	Upper Door Handle					
61	Lower Door					
62	Lower Door Lining					
63	Lower Door Slide					
64	Lower Door Handle					
65	Smoke Collar	3.20	3.50	4.20	6.75	6.75
66	Sheet Iron Drum	25.00	26.00	27.00	30.40	35.00
67	Sheet Iron Horseshoe	25.00	26.00	27.00	30.40	35.00
70	Base Ring	4.50	4.80	5.80	6.70	8.70
71	Middle Ring	14.80	14.80	17.30	19.50	20.00
72	Top Ring	7.00	7.00	7.00	7.70	9.30
80	Poker	1.50	1.50	1.50	1.50	1.50

600 Series "Perfect" Furnaces

(See illustration, page 10)

No.	Name of Part	LIST PRICES					
		636 637	640 641	644 645	650 651	654 655	660
	BASE						
15	Main Bar, R or L	$4 10	$5.00	$5.50	$8.00	$10.50	13.00
16	Short Bar, R or L	2.50	3.30	3.90	5.20	7.80	9.00
13	Grate Hanger for Grate Bars	2.70	3.10	3.50	3.80	5.80	6.20
12	Shaker Handle	1.90	1.90	1.90	1.90	3.20	3.20
	Grate Frame	3.80	5.80	6.40	7.70	8.30	10.90
	Cast Iron Tee	5.80	5.80	7.70	7.70	8 10	.....
17	Waterpan only—For 636-660 Series	13.50	13.50	16.00	16.00	16.00	16.00
	For 637-655 Series	8.30	8.30	8.30	8.30	8.30	.....
18	Waterpan Frame—For 636-660 "	2.60	2.60	2.60	2.60	2.60	2.60
	For 637-655 "	1.90	1.90	1.90	1.90	1.90	.....
19	Waterpan Covers	.80	.80	.80	.80	.80	.80
8	Door Handles	.40	.40	.40	.40	.40	.40
	FIREPOT						
30	Pot	41.00	46.00	51.00	71.00	87.00	110.00
	BODY						
40	Body, less Generator	36.00	51.00	56.00	78.00	92.00	.....
	Generator Complete, less Galv'd Side Pipes	11.50	13.00	14.00	18.50	20.00	.....
44	Feed Door Complete	4.50	7.10	7.10	7.10	7.70	.....
42	Feed Door Frame	3.80	3.80	3.80	4.50	5.10	.....
	CAST RADIATOR						
	Cast Iron Radiator	76.00	95.00	109.00	131.00	.....	.....
53	Smoke Collar	3.20	3.20	4.60	4.60	3.80	.....

82 and 82-E Series "Perfect" Furnaces

(See illustration, page 10)

No.	Name of Part	LIST PRICES 82 82-E	83 83-E	84 84-E	86
	BASE				
1	Bottom Plate	$10.00	$11.20	$17.30	$38.00
	Top Section	.....	.....	.....	41.00
2	R. Side	7.00	7.70	8.00	.....
3	L. Side	7.00	7.70	8.00	.....
4	Back	6.80	8.30	9.60	.....
5	Top	5.50	6.40	7.70	.....
6	Frame	7.20	7.20	8.40	10.80
7	Door Complete	9.20	9.60	11.00	16.00
10	Flap Door	1.60	1.60	2.00	2.00
9	Door Slide	1.20	1.20	1.60	1.60
13	Front Yoke	1.70	2.50	3.00	5.00
12	Shaker	1.50	1.50	1.50	2.20
15	Main Bar, R or L,"E" Pattern	6.00	8.20	9.60	
16	Short Bar, R or L,"E" Pattern	4.40	6.00	6.60	
15	Main Bar, R or L,"A" Pattern	5.00	5.50	8.00	13.00
16	Short Bar, R or L,"A" Pattern	3.30	3.90	5.20	9.00
17	Waterpan	6.75	6.75	6.75	6.75
18	Waterpan Frame	2.00	2.00	2.00	2.00
19	Waterpan Cover	.80	.80	.80	.80
	FIREPOT				
30	Pot	45.50	53.50	71.50	77.00
	BODY				
	Upper Section	47.00	70.00	76.00	96.00
	Lower Section	15.00	19.00	20.50	34.00
44	Feed Door and Lining	5.50	5.50	5.50	6.00
42	Feed Door Frame	4.50	4.50	4.50	4.50
45	Feed Door Lining	1.60	1.60	1.60	2.00
	Dust Grate	.50	.50	.50	.80
	Packing Rings, Large	3.20	3.20	4.00	4.80
	Packing Rings, Small	1.20	1.20	1.20	.....
	Plug	.80	.80	1.00	2.00
	Cast Radiator	79.00	92.00	111.00	181.00
	C. O. Plug	.80	.80	.80	.80
	PANEL FRONT				
62	Panel Front only	12.00	14.00	14.00	20.00
64	C. O. Door	2.00	2.00	2.00	2.80
63	Dust Door	2.40	2.40	2.40	2.40
	Dust Flue and Damper	1.50	1.50	1.50	1.50
	Dust Damper and Rod	.70	.70	.70	.70
65	Base Ring	4.80	5.80	6.80	7.70
66	Middle Ring	6.10	7.70	7.70	11.00
67	Top Ring	5.50	4.80	5.50	7.70

Giant Series Furnaces

(See illustration, page 10)

No.	Name of Part	LIST PRICES							
		28	32	36	40	44	50	54	60
	BASE								
13	Grate Hanger..........	$1.90	$2.30	$2.70	$3.10	$3.50	$3.80	$5.80	$6.20
15	Main Grate Bar R or L..	2.50	3.90	4.10	5.00	5.50	8.00	10.50	13.00
16	Short Grate Bar, R or L.	1.70	2.80	2.50	3.30	3.90	5.20	7.80	9.00
12	Shaker Handle.........	1.90	1.90	1.90	1.90	1.90	1.90	3.20	3.20
17	Waterpan Only	13.50	13.50	13.50	13.50	16.00	16.00	16.00	16.00
18	Waterpan Frame	2.60	2.60	2.60	2.60	2.60	2.60	2.60	2.60
19	Waterpan Cover	.80	.80	.80	.80	.80	.80	.80	.80
	FIREPOT								
30	Pot..................	22.50	39.00	39.00	42.00	50.00	73.00	90.00	114.00
	BODY								
40	Body—High type.......	....	29.50	35.50	50.00	55.00	78.00	....	....
40	Body—Low type.......	....	26.00	27.00	44.00	47.00	65.00	....	....
44	Feed Door Complete....	....	2.70	3.10	4.20	4.20	4.20	5.80	....
42.	Feed Door Frame......	....	3.50	4.20	4.60	5.40	5.40	3.80	....
	STEEL RADIATOR								
50	Top Plate............	8.70	11.50	14.10	18.50	21.00	28.00	....	....
51	Bottom Plate..........	8.00	9.30	12.00	15.50	18.00	24.50	....	....
53	Smoke Collar..........	1.30	1.30	1.30	1.60	1.60	1.60	....	....
54	Cleanout Collar........	1.20	1.20	1.60	2.00	2.00	2.90	....	....
55	Cleanout Galv'd Cap...	.80	.80	.80	.80	.80	.80	....	....
56	Sheet Iron Drum.......	5.30	6.00	6.30	6.80	7.60	9.00	....	....
57	Sheet Iron Horseshoe...	5.30	6.00	6.30	6.80	7.60	9.00	....	....
	CAST RADIATOR								
58	Cast Radiator only.....	....	61.00	64.00	73.50	77.00	119.00	....	....
59	Cleanout Plug..........	....	.80	.80	.80	.80	.80	....	....
60	Cleanout Turnbuckle...	....	.20	.20	.20	.20	.20	....	....
61	Cleanout Galv'd Cap...	....	.80	.80	.80	.80	.80	....	....
	Smoke Thimble........	....	3.50	3.50	3.50	4.50	4.80	....	....

Repair List for

RICHARDSON

"PERFECT"
COOKING RANGES
LAUNDRY AND
WATER HEATERS

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WE can furnish many parts for older types of Ranges not shown in this catalogue. We have not been able to replace a few patterns destroyed by fire in 1914. It would be well to inquire before quoting on repair work of inactive Ranges.

Larger space, planned production and a larger personnel enable us to offer prompt service in filling orders for repair parts. We appreciate the necessity of prompt, correct shipments. Whenever repairs are especially urgent because of breakdown jobs, we will try to make preference, if you so state.

Please note our suggestions for ordering, so we will not have to ask for further information.

Instructions for Ordering Range Repairs

Each range has a style number which should always be given when ordering parts. Sometimes this style number is followed by a letter which indicates a change in pattern of this style of range. Be sure that the complete number and letter is given. It will be found on fire door or left hand rear of cooking top.

Single Oven Ranges

Advise whether or not range has waterback.

State whether it has regular or "L" waterback.

If there is no waterback kindly state so.

Specify whether fire box is at right or left when facing range.

When ordering grate bar, advise whether it is right or left hand.

Advise whether long or short centers of range top are needed.

Advise if range is in brickset form or portable form when ordering repairs for range top.

Double Oven Ranges

Advise shape and size of waterback.

If there is no waterback so state.

When ordering grate bar, advise whether it is right or left hand.

Advise whether long or short centers of range top are needed.

Advise if range is in brickset form or portable form when ordering repairs for range top.

If parts of base are needed specify whether base is skeleton or complete closet with bottom.

Be sure to specify the name on the oven door.

New England or Leg Base Type Ranges

Give correct number and letter, if any, at the left-hand rear of cooking top.

Indicate whether range has waterback or pipe coil.

If there is no waterback or pipe coil so state.

In each case specify whether a range has a leg base or cabinet base.

Specify whether range is fitted with triangular or dock-as grate bars.

When ordering grate bar, advise whether it is right or left hand.

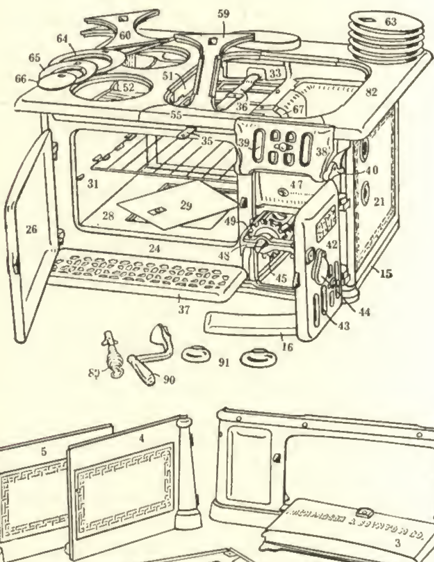
Advise whether long or short centers of range top are needed.

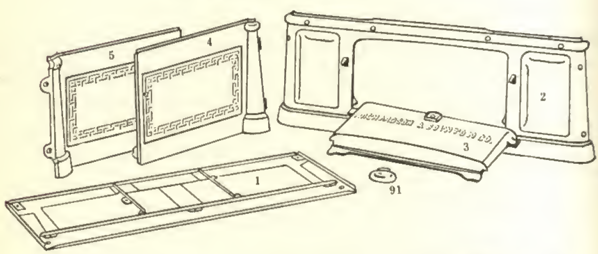
395E "Perfect" Range

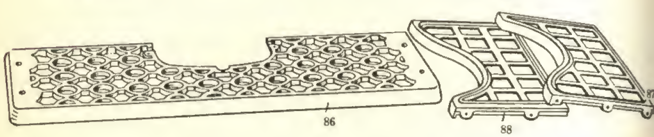
Shown with Right-hand Fire Box

Illustration will serve as well for most parts of the older types:

395, 395A, 395B, 395C, 398, 495, 498







When ordering parts kindly state:—

1. Number and Letter if any, on Fire Door.
2. Whether Range has regular or "L" Waterback.
3. Whether Range is Portable or Brickset.
4. Whether Range has Fire Box at right or left as you face it.

Single Oven Ranges

(See illustrations, pages 4 and 6)

No.	Name of Part	LIST PRICES			
		395-E	448-E	658-E	278
	MARGIN (395-E only)				
1	Back	$5.50	.....	.....	.....
2	Front	5.00	.....	.....	.....
3	Door	3.30	.....	.....	.....
4	Right End	2.60	.....	.....	.....
5	Left End	2.60	.....	.....	.....
	CLOSET (not with 395-E)				
6	Ash Bottom	.....	$3.70	$3.70	$4.80
7	Back	.....	5.20	6.00	6.40
8	Front	.....	5.00	5.00	4.00
9	Closet Door	.....	3.60	4.40	5.20
10	Ash Door	.....	2.00	2.40	2.80
11	Right End	.....	3.30	3.50	3.70
12	Left End	.....	3.30	3.50	3.70
13	Division Plate	.....	2.20	2.20	2.20
14	Bottom for Ash Chute	.....	3.00	3.00	4.00
	RANGE				
15	Bottom	9.00	8.00	11.00	11.00
16	Ash Hearth (395-E only)	.50	....	.....	.....
17	Flue Strip (in bottom)	.50	.80	.50	.50
18	Flue Strip Extension (in bottom)	.....	.....	.....	.20
19	Back	8.00	8.40	9.50	9.50
20	Back Flue	2.60	6.00	7.00	7.00
21	Open End (waterback side)	4.00	4.00	4.00	5.20
22	Closed End	4.00	4.00	4.00	5.20
23	End Flue Strip (inside)	.50	.....	.....	.....
24	Front	5.00	5.20	5.50	5.50
25	Flue Stopper (not 395-E)	.....	.40	.40	.40
26	Oven Door	4.50	5.20	8.00	8.00
27	Oven Door Kicker	.....	.50	.50	.50
28	Oven Bottom	3.70	4.00	5.00	5.50
29	Oven Bottom Cleanout Plate (395-E only)	1.10	.....	.....	.....
30	Oven Top	3.70	4.40	5.50	6.60
31	Oven Back (side oven plate)	3.70	3.70	3.70	4.40
32	Oven Front (side oven plate)	3.70	3.70	3.70	4.40
33	Oven Damper	.70	.70	.70	.70
34	Oven Damper Clamps (2)	.....	.30	.30	.30
35	Oven Damper Front Handle	.35	.35	.35	.35
36	Oven Damper Back Handle	.35	.35	.35	.35
37	Oven Hearth	1.50	2.00	3.50	4.00
38	Feed Door	1.60	2.20	2.50	2.50
39	Feed Door Slide	.50	.50	.50	.50
40	Feed Door R Lug	.20	.20	.20	.20
41	Feed Door L Lug	.20	.20	.20	.20
42	Fire Door	2.20	2.50	3.00	3.70
43	Fire Door Slide	.50	.50	.50	.50
44	Shaker Stopper	.20	.20	.20	.20
45	Long Bar	1.80	1.90	2.50	2.75
46	Short Bar	1.80	1.90	2.50	2.75
47	Front Grate	1.60	1.60	2.00	2.50
48	Grate Frame	1.40	1.60	1.60	2.80

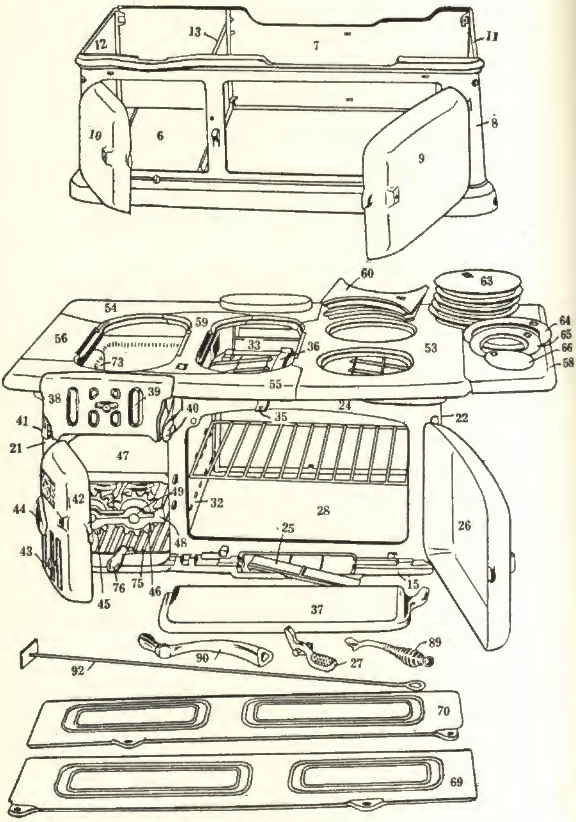
"Perfect" Range

448E, 658E, 278

Shown with Left-hand Fire Box

Illustration will serve as well for most parts of the older types:

447, 448, 547, 548, 458, 458A, 658, 658A, 758



When ordering parts kindly state:—

1. Number and Letter if any, on Fire Door.
2. Whether Range has regular or "L" Waterback.
3. Whether Range is Portable or Brickset.
4. Whether Range has Fire Box at right or left as you face it.
5. If Range is Black, Gray or Blue Enamel.

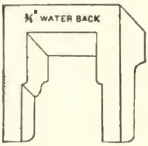
Single Oven Ranges

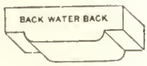
(See illustrations, pages 4 and 6)

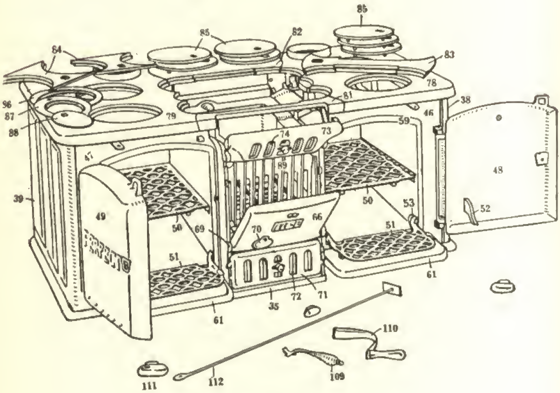
No.	Name of Part	LIST PRICES			
		395-E	448-E	658-E	278
49	Grate Clamp	$ .40	$ .40	$ .40	$ .40
50	Brick Rest	1.40	1.40	2.00	2.20
51	Top Flue Strip (395-E only)	.50	.....	.....	.....
52	Top Flue Strip Extension (395-E only)	.40	.....	.....	.....
53	"E" Large Top	9.20	5.50	7.00	8.00
54	Back Top Portable (not 395-E)	.....	3.00	3.00	3.00
55	Front Top Portable	1.10	1.50	2.00	2.60
56	Small Top Portable (not 395-E)	.....	1.50	2.00	3.30
57	Top Slide Damper	.....	.....	.....	.50
58	End Shelf (not 395-E)	.....	3.30	4.00	4.40
59	Long Center	1.10	.....	1.40	1.70
60	Short Center	.80	.80	.80	.80
61	Long Center Stud	.20	.....	.....	.....
62	"T" Center (448-E only)	.....	1.10	.....	.....
63	Covers	.80	.80	.80	.80
64	Outer Sectional Ring				
65	Inner Sectional Ring	1.00	1.00	1.00	1.00
66	Sectional Cover Cover				
67	Brick Clamp	.20	.30	.30	.30
68	Waterback Stopper	.30	.30	.30	.30
69	Portable Panel Right	2.60	2.60	3.00	2.60
70	Portable Panel Left	2.60	2.60	3.00	2.60
73	Waterback	8.00	8.00	9.25	10.00
74	"L" Waterback	16.00	16.00	16.00	16.00
75	Sifter Grate	.....	1.10	1.40	2.00
76	Sifter Grate Handle	.....	.30	.30	.30
77	Sifter Grate Handle Stopper	.....	.....	.....	.....
78	Thermometer Oven Door	7.50	8.20	11.00	11.00
79	Large Top Brickset	.....	5.10	6.60	7.60
80	Back Top Brickset	.....	2.60	2.60	2.60
81	Small Top Brickset	.....	1.50	2.00	3.30
82	Large Top "X"	.....	.....	.....	.....
83	Waterback Brick	1.90	1.90	1.90	2.50
84	Full Brick	3.00	3.00	3.00	4.50
85	Sub Brick	1.20	1.20	1.20	1.70
86	Plate Rack, Black Iron	6.00	6.00	6.00	6.00
87	Right Bracket, Black Iron	2.00	2.00	2.00	2.00
88	Left Bracket, Black Iron	2.00	2.00	2.00	2.00
89	Lifter	.40	.40	.40	.40
90	Shaker	.70	.70	.70	.70
91	Door Handles	.20	.20	.20	.20
92	Scraper	.70	.70	.70	.70
	Oven Rack	.80	.90	.90	3.70
	Ash Pan	.....	1.60	1.70	2.50

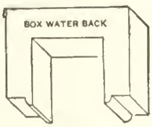
"Perfect" Double Oven Ranges

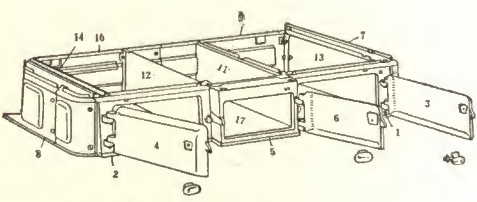
11, 111, 111E, 12, 112, 112E, 13, 113, 113E, 14, 114, 114E, 211, 212











When ordering parts kindly state:—

1. Number and Letter if any, on Fire Door.
2. Style of Waterback if any, in Range.
3. Whether Range is Portable or Brickset.
4. Whether Range has Lower Hot Closet or Margin Base.

Double-Oven Cast-Iron Ranges

(See illustration, page 8)

No.	Name of Part	LIST PRICES			
		111-E	112-E	113-E	114-E
	MARGIN				
1	Front Right	$1.60	$1.60	$1.60	$2.00
2	Front Left	1.60	1.60	1.60	2.00
3	Front Door Right	2.00	2.00	2.00	2.00
4	Front Door Left	2.00	2.00	2.00	2.00
5	Front Middle	2.60	2.60	2.60	2.60
6	Front Door Middle	1.60	1.60	1.60	1.60
7	End Column Right	1.20	1.50	1.50	1.50
8	End Column Left	1.20	1.50	1.50	1.50
9	Back Right	2.20	2.20	2.20	3.00
10	Back Left	2.20	2.20	2.20	3.00
11	Ashplate Right	2.20	2.20	2.20	2.20
12	Ashplate Left	2.20	2.20	2.20	2.20
13	End Right	2.60	2.60	2.60	2.60
14	End Left	2.60	2.60	2.60	2.60
15	Back Strips	.80	1.10	1.10	1.10
16	End Braces	.30	.30	.30	.30
17	Ash Bottom	4.00	4.00	4.00	4.00
	CLOSET				
18	Front Right	1.60	2.00	2.00	2.60
19	Front Left	1.60	2.00	2.00	2.60
20	Front Door Right	2.80	2.80	2.80	2.80
21	Front Door Left	2.80	2.80	2.80	2.80
22	Front Middle	2.60	2.60	2.60	3.00
23	Front Door Middle	2.00	2.40	2.40	2 40
24	End Column Right	1.50	2.00	2.00	2.00
25	End Column Left	1.50	2.00	2.00	2.00
26	Back Right	3.30	3.30	3.30	4.80
27	Back Left	3.30	3.30	3.30	4.80
28	Ashplate Right	3.00	3.00	3.00	3.00
29	Ashplate Left	3.00	3.00	3.00	3.00
30	End Right	3.00	3.00	3.00	3.00
31	End Left	3.00	3.00	3.00	3.00
32	Back Strips	1.50	1.90	1.90	1.90
33	End Braces	.30	.30	.30	.30
34	Ash Bottom	4.00	4.00	4.00	4.00
	RANGE				
35	Bottom	16.50	17.20	17.20	23.00
36 37	Flue Strips (under ovens) Flue Strips Extension (under ovens)	.50	.50	.50	.50
38	End Right	6.20	6.20	6.20	6.20
39	End Left	6.20	6.20	6.20	6.20
40	End Braces (inside ends)	.30	.30	.30	.30
41	End Waterback Stopper	.30	.30	.30	.30
42	Back Waterback Stopper	.30	.30	.30	.30
43	Back	18.00	22.00	22.00	22.00
44	Back Strips	1.90	3.00	3.00	3.00
45	End Columns	2.20	2.90	2.90	2.90

Double-Oven Cast-Iron Ranges

(See illustration, page 8)

No.	Name of Part	LIST PRICES 111-E	112-E	113-E	114-E
46	Front Right	$4.50	$5.10	$5.10	$5.50
47	Front Left	4.50	5.10	5.10	5.50
48	Oven Door Right	6.00	7.20	7.20	9.20
49	Oven Door Left	6.00	7.20	7.20	9.20
50	Oven Slides, (each)	1.90	1.90	1.90	1.90
51	Fret Hearths, (each)	1.20	1.20	1.20	1.20
52	Fret Hearths Lifts, (each)	.30	.30	.30	.30
53	Fret Hearths Lugs R	.10	.10	.10	.10
54	Fret Hearths Lugs L	.10	.10	.10	.10
55	Oven Back Right	3.70	4.40	4.40	4.40
56	Oven Back Left	3.70	4.40	4.40	4.40
57	Oven Damper Right	.50	.50	.50	.70
58	Oven Damper Left	.50	.50	.50	.70
59	Oven Damper Rods	.70	.70	.70	.70
60	Oven Damper Clamps (set)	.30	.30	.30	.30
61	Oven Hearths, (each)	2.50	3.00	3.00	3.00
62	Fireplate Right (side of firebox)	4.00	4.00	4.00	4.00
63	Fireplate Left (side of firebox)	4.00	4.00	4.00	4.00
64	Angle Iron Right	2.20	2.20	2.20	2.20
65	Angle Iron Left	2.20	2.20	2.20	2.20
66	Fire Door	3.50	3.50	3.50	4.00
67	Fire Door Lining	.80	.80	.80	.80
68	Fire Door Lug R	.20	.20	.20	.20
69	Fire Door Lug L	.20	.20	.20	.20
70	Shaker Stopper	.20	.20	.20	.20
71	Draft Door	1.50	1.50	1.50	1.50
72	Draft Door Slide	.40	.40	.40	.40
73	Feed Door	3.00	3.00	3.00	3.50
74	Feed Door Slide	.50	.50	.50	.50
75	Feed Door Lug R	.20	.20	.20	.20
76	Feed Door Lug L	.20	.20	.20	.20
77	Feed Door Frame	1.20	1.20	1.20	1.60
78	End Top Right	9.10	9.50	9.50	11.60
79	End Top Left	9.10	9.50	9.50	11.60
80	Top Supports, (each)	.30	.30	.30	.30
81	Front Top	1.20	1.20	1.20	1.20
82	Back Top	2.00	2.00	2.00	2.00
83	Long Center	1.40	1.40	1.40	1.90
84	Short Center	.80	.80	.80	1.10
85	Covers	.80	.80	1.40	1.40
86	Sectional Cover Outer Ring				
87	Sectional Cover Inner Ring	1.00	1.00	1.70	1.70
88	Sectional Cover Cover				
89	Front Grate	3.90	4.40	4.40	4.40
90	Long Bar	2.90	2.90	2.90	2.00
91	Short Bar	2.90	2.90	2.90	2.00
92	Bed Plate Right				
93	Bed Plate Left	6.00	6.00	6.00	7.10
94	Bed Plate Front				
95	Front Grate Holder				
96	Back Grate Holder	6.00	6.00	6.00	7.10
97	Grate Hook				
98	Grate Lock				

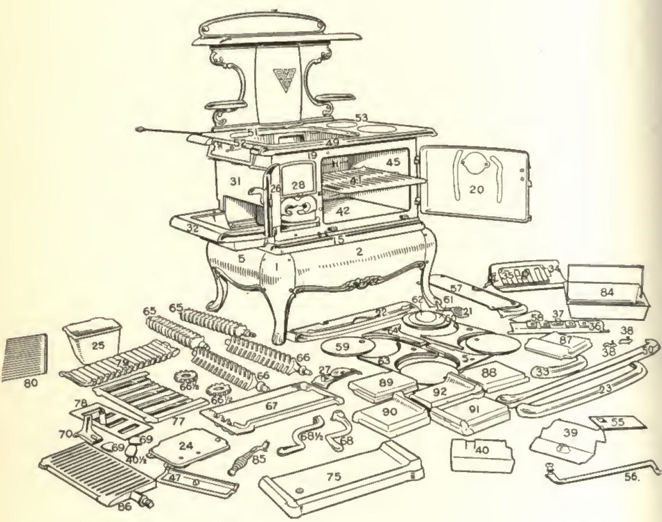
Double-Oven Cast-Iron Ranges

(See illustration, page 8)

No.	Name of Part	LIST PRICES			
		111-E	112-E	113-E	114-E
99	Waterback Shield	$1.90	$1.90	$1.90	$2.20
100	Brick Clamp, each	.30	.30	.30	.30
102	Box Waterback	14.00	14.00	14.00	14.00
103	Back Waterback	9.50	9.50	9.50	9.50
104	¾ Waterback	16.00	16.00	16.00	16.00
105	Box Waterback Brick	2.70	2.70	2.70	2.70
106	Back Back Waterback Brick	2.70	2.70	2.70	2.70
107	¾ Waterback Brick	2.70	2.70	2.70	2.70
108	Full Brick	5.00	5.00	5.00	5.00
109	Lifter	.40	.40	.40	.40
110	Shaker	.70	.70	.70	.70
111	Door Handles	.20	.20	.20	.20
112	Scraper	.70	.70	.70	.70
	Sheet Iron Oven R. H.	7.00	7.75	7.75	11.50
	Sheet Iron Oven L. H.	7.00	7.75	7.75	11.50
	Ash Pan	1.75	2.00	2.00	2.00

"Gem"—"Royal"—"Grand" Ranges

7-18, 8-18, 8-20, 9-20, 108-20, 208-20



When ordering parts kindly state:—

1. Name of Range as shown on Oven Door.
2. Number and Letter if any, shown at left, rear of top.
3. Whether Range has Waterfront or Pipe Coil.
4. Whether Range has Leg or Cabinet Base.
5. If Range is Black, Blue or Gray Enamel.
6. If Range has Reservoir or End Gas Attachment.
7. If Fire Box Fixtures are for Wood Fuel.
8. Whether fitted with Triangular or Dockash Grate Bars.

Leg or Cabinet Base Ranges

(See illustration, page 12)

No.	Name of Part	LIST PRICES					
		Gem		Royal		Grand	
		7–18	8–18	8–18	8–20	108–20	208–20
	SKIRT						
1	Legs, (each)	$1.50	$1.50	$1.50	$1.50	$1.90	$1.90
2	Front	3.70	3.70	3.70	3.70	4.00	5.20
3	Back	3.70	3.70	3.70	3.70	4.00	5.20
4	R End	2.20	2.20	2.60	2.60	2.60	3.30
5	L End	2.20	2.20	2.60	2.60	2.60	3.30
	CABINET						
6	Front	4.50	4.50	5.50	5.50	7.00	7.00
7	Back	7.40	7.40	7.40	7.40	9.00	9.00
8	R End	4.40	4.40	4.80	4.80	4.80	4.80
9	L End	4.40	4.40	4.80	4.80	4.80	4.80
10	Closet Door	2.80	2.80	2.80	2.80	4.00	4.00
11	Ash Door	2.80	2.80	2.80	2.80	2.80	2.80
12	Ash Bottom	3.70	3.70	4.80	4.80	4.80	4.80
13	Division Plate	3.70	3.70	3.70	3.70	3.70	3.70
	RANGE						
15	Bottom	9.10	9.10	9.10	9.10	10.60	10.60
16	Bottom Flue Strip (under oven)	.70	.70	.80	.80	.80	.80
17	Back	6.20	6.20	6.60	7.40	9.10	9.10
18	Back Flue	1.90	1.90	3.40	3.40	2.60	2.60
19	Front	4.50	4.50	5.50	5.50	5.50	5.50
20	Oven Door	3.60	3.60	4.50	4.50	6.50	6.00
21	Oven Door Kicker	.50	.50	.50	.50	.50	.50
22	Oven Hearth	1.90	1.90	1.90	1.90	2.60	2.60
23	Oven Hearth Rail N. P.	1.20	1.20	1.20	1.20	1.50	1.50
24	Firebox Back Plate	1.50	1.50	1.50	1.50	1.50	1.50
25	Wood Box	3.00	3.00	3.00	3.00	3.00	3.00
26	Fire Door	2.00	2.00	2.00	2.00	2.00	2.00
27	Gear Cover	.80	.80	.80	.80	.80	.80
28	Gear Cover Catch	.....	.....	.....	.....	.....	.....
29	Closed End (Right)	4.00	4.00	5.50	5.50	5.50	5.50
30	End Flue Strip	.80	.80	.80	.80	.80	.80
31	Open End (Left)	2.60	2.60	3.40	3.40	3.40	3.40
32	Ashpit	5.20	5.20	5.50	5.50	5.50	6.60
33	Ashpit Rail N. P.	....	.....	1.20	1.20	1.20	1.20
34	Ashpit Door	1.60	1.60	2.80	2.80	2.80	4.00
35	Ashpit Draft Slide	.80	.80	.80	.80	.80	.80
36	Feed Door	1.80	1.80	2.20	2.20	2.20	2.20
37	Feed Door Slide	.80	.80	.80	.80	.80	.80
38	Feed Door Lugs	.40	.40	.40	.40	.40	.40
39	Front Ash Chute	.80	.80	1.10	1.10	1.10	1.10
40	Back Ash Chute	.80	.80	1.10	1.10	1.10	1.10
41	Oven Slide	1.90	1.90	2.60	2.60	2.60	2.60
42	Oven Bottom	3.70	3.70	3.70	4.80	5.20	5.20
43	Oven Top	3.70	3.70	5.50	5.50	6.00	6.00
44	Oven Front L. H.	3.00	3.00	3.30	3.30	3.30	3.30

Leg or Cabinet Base Ranges

(See illustration, page 12)

No.	Name of Part	LIST PRICES Gem 7–18	Gem 8–18	Royal 8–18	Royal 8–20	Grand 108–20	Grand 208–20
45	Oven Back	$2.60	$2.60	$2.60	$2.60	$2.60	$2.60
46	Top Flue Strip	.80	.80	1.50	1.50	1.10	1.10
47	Flue Stopper	.80	.80	.80	.80	.80	.80
48	Flue Stopper Catch	.....	.....	.....	.....	.....	.....
49	Front Top	2.20	2.20	3.30	3.30	3.70	3.70
50	Front Top Rail N. P.	1.20	1.20	2.40	2.40	2.40	2.40
51	Back Top	5.20	4.00	4.80	4.80	4.80	4.80
52	Left Top	1.10	.80	1.10	1.10	1.10	1.10
53	Right Top	2.00	2.00	2.60	2.60	3.00	3.00
54	Top Check Damper	.50	.50	.50	.50	.50	.50
55	Oven Damper	.60	.60	.60	.60	.60	.60
56	Oven Damper Handle	.60	.60	.60	.60	.60	.60
57	End Shelf	3.00	3.00	3.00	3.00	3.00	4.50
58	End Shelf Rail N. P.	.60	.60	.60	.60	1.20	1.20
59	Covers	1.10	1.10	1.10	1.10	1.10	1.10
60	Outer Sectional Ring						
61	Inner Sectional Ring	1.10	1.10	1.10	1.10	1.10	1.10
62	Cover Sectional Ring						
63	Short Centers	.80	.80	.80	.80	.80	.80
64	Long Centers	1.70	1.40	1.40	1.40	1.40	1.40
65	Dockash Grate Bar, (each)	1.95	1.95	2.20	2.20	2.20	2.20
66	Triangular Grate Bar, (each)	1.80	1.80	2.00	2.00	2.00	2.00
66½	Gears (included with bars)	.....	.....	.....	.....	.....	.....
67	Grate Frame	1.50	1.50	1.70	1.70	1.70	1.70
68	Dockash Shaker	.60	.60	.60	.60	.60	.60
68½	Triangular Shaker	.60	.60	.60	.60	.60	.60
69	Waterfront Stopper	.50	.50	.50	.50	.50	.50
70	Brick Clamp	.30	.30	.60	.60	.60	.60
71	Sub-brick Clamp	.30	.30	.20	.20	.20	.20
72	Cabinet Draft Door	1.40	1.40	2.20	2.20	2.20	2.20
73	Cabinet Draft Door Slide	.50	.50	.50	.50	.50	.50
74	Cabinet Draft Door Frame	2.00	2.00	2.00	2.00	2.00	2.00
75	Waterfront	9.00	9.00	9.00	9.00	9.00	9.00
76	Waterfront Coil Plate	1.90	1.90	2.90	2.90	2.90	2.90
77	Wood Grate	2.80	2.80	3.00	3.00	2.80	2.80
78	Wood Grate Draw Center						
79	Wood Waterback Casting	2.00	2.00	2.20	2.20	2.00	2.00
80	Wood Oven Casting	2.00	2.00	2.20	2.20	2.00	2.00
81	Full Set Brick	4.00	4.00	4.00	4.00	4.00	4.00
82	Waterfront Set of Brick	2.50	2.50	2.50	2.50	2.50	2.50
83	Sub Brick	1.60	1.60	1.60	1.60	1.60	1.60
84	Ashpan	1.60	1.60	1.60	1.60	1.60	1.60
85	Lifter	.50	.50	.50	.50	.50	.50
86	Plain Grate	.....	.....	.....	.....	.....	.....
87	No. 1 Brick, Front End						
88	No. 2 Brick, Oven Side	2.40	2.40	2.40	2.40	2.40	2.40
89	No. 3 Brick, Oven Side						
90	No. 4 Brick, Back End						
91	No. 5 Brick, L. H. Side	3.10	3.10	3.10	3.10	3.10	3.10
92	No. 6 Brick, L. H. Side						

Nos. 87-88-89-90 make up waterfront brick.
Nos. 91-92 replace waterfront to make full brick.

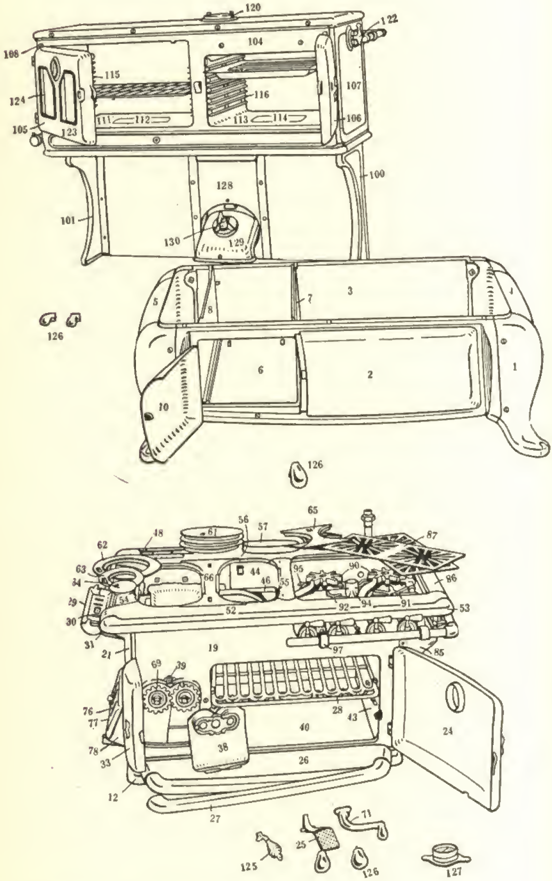
Combination Ranges

(See illustrations, pages 16 and 18)

No.	Name of Part	LIST PRICES		
		88	188	288-X
	CLOSET			
1	Legs, each (288 only)	.....	.....	$1.60
2	Front	$3.30	$3.30	4.80
3	Back	5.00	5.00	5.10
4	R End	3.00	3.00	3.00
5	L End	3.00	3.00	3.00
6	Ash Bottom	4.00	4.00	3.00
7	R Division Plate	2.60	2.60	2.20
8	L Division Plate (288 only)	.....	.....	2.20
9	Closet Door (88-188)	4.00	4.00	.....
10	Ash Door	2.40	2.40	2.40
11	Bottom for Ash Chute	.....	.....	.....
	RANGE			
12	Bottom	10.00	10.00	13.00
13	Flue Strip (under oven)	.50	.50	.50
14	Back	8.80	8.80	10.00
15	Back Flue Compl. (188-288, one piece)	....	8.00	4.40
16	Back Flue Top (88 only)	3.30	.....	.....
17	Back Flue Bottom (88 only)	4.40	.....	.....
18	Waterback Stopper	.30	.30	.30
19	Front	5.50	5.50	7.50
20	Flue Stopper	.40	.40	.40
21	Left End	5.50	5.50	4.80
22	Right End	4.40	4.40	4.40
23	End Flue Strip	.....	.....	.80
24	Oven Door	5.50	6.00	6.00
25	Oven Door Kicker	.50	.50	.50
26	Oven Hearth	3.50	3.50	3.00
27	Oven Hearth Rail (288 only)	.....	.....	1.00
28	Oven Slide	.80	.80	3.00
29	Feed Door	2.20	2.20	2.20
30	Feed Door Slide	.50	.50	.50
31 32	Feed Door R. Lug Feed Door L. Lug	.40	.40	.40
33	Fire Door	3.60	3.60	2.40
34	Fire Door Slide (88-188)	.50	.50	.....
35	Shaker Stopper (88-188)	.20	.20	.....
36	Fire Door Ash Chute (88-188)	.50	.50	.....
38	Gear Cover (288 only)	.....	.....	1.00
39	Gear Cover Catch (288 only)	.....	.....	.10
40	Oven Bottom	4.40	4.40	5.50
41	Oven Top	5.50	5.50	7.70
42	Oven Front	4.00	4.00	4.80
43	Oven Back	3.00	3.00	3.70
44	Oven Damper	.70	.70	.70
45	Oven Damper Lugs	.30	.30	.....
46	Oven Damper Slide	.....	.....	.50

288-X "Perfect" Range

For Coal and Gas Fuels



When ordering parts kindly state:—

1. Number and Letter if any, shown at left, rear of top.
2. Whether Range has Waterback or Pipe Coil.
3. If Range is Black, Gray or Blue Enamel.

Combination Ranges

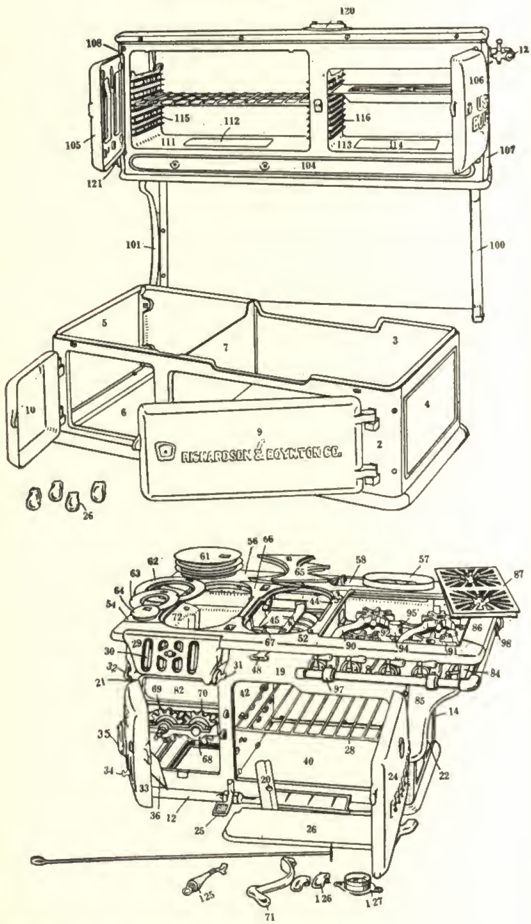
(See illustrations, pages 16 and 18)

No.	Name of Part	LIST PRICES		
		88	188	288–X
47	Oven Damper Back Handle (88-188)	.....	.....	$ .70
48	Oven Damper Front Handle (88-188)	$ .70	$ .70	.....
49	Top Flue Strip (288 only)	.....	.....	.50
50	Top Flue Strip Ext. (288 only)	.....	.....	.50
51	Back Firebox Plate (288 only)	.....	.....	1.20
52	Front Top	3.00	3.00	3.70
53	Front Top Rail (288 only)	.....	.....	2.50
54	Left End Top	1.50	1.50	1.20
55	Middle Top	1.20	.....	.80
56	Back Top	4.40	3.00	5.50
57	Back Top Collar	.50	.50	.50
58	Top Slide Damper	.50	.50	.50
59	R. Top Support (back of range)	.80	.80	.80
60	L. Top Support (back of range)	.80	.80	.80
61	Covers	1.10	1.10	1.10
62	Outer Sectional Ring			
63	Inner Sectional Ring	1.40	1.40	1.40
64	Cover Section Ring			
65	Short Centers	.80	.80	.80
66	Long Center	1.40	1.40	1.40
67	Brick Clamp	.20	.20	.20
68	Grate Frame	1.70	1.70	1.40
69	Long Grate Bars	2.50	2.50	2.20
70	Short Grate Bars	2.50	2.50	2.20
71	Shaker	.60	.60	.60
72	Waterback	9.25	9.25	10.00
73	"L" Waterback	16.00	16.00	16.00
74	Portable Panel R	2.20	2.20	.....
75	Portable Panel L	2.20	2.20	.....
76	Open End Door (288 only) and Slide	.....	.....	2.50
77	Open End Door Slide (288 only)	.....	.....	1.00
78	Open End Door Frame (288 only)	.....	.....	2.00
79	Full Set Brick	3.00	3.00	4.50
80	Waterback Brick	1.90	1.90	2.50
81	Sub-Brick	1.20	1.20	1.70
	GAS SECTION			
82	Bottom (under burners)	6.20	5.50	5.50
83	Bottom Handhole Cover	.40	.40	.80
84	Upper Outer End	1.90	1.90	1.90
85	End Bracket	.80	.80	.50
86	Right End Top	1.20	5.50	1.10
87	Top Frets (each)	2.00	2.00	2.00
88	Solid Top Panels	2.00	2.00	2.00
89	Solid Top Covers	.40	.40	.40
90	Long Burners	3.50	3.50	3.50
91	Large Short Burner	3.00	3.00	3.00
92	Small Short Burner	2.50	2.50	2.50

88 "Perfect" Range

For Coal and Gas Fuels

Old Style No. 188



When ordering parts kindly state:—

1. Number and Letter if any, on Fire Door.
2. Whether Range has Regular or "L" Waterback.
3. If Range is Black, Gray or Blue Enamel.

Combination Ranges

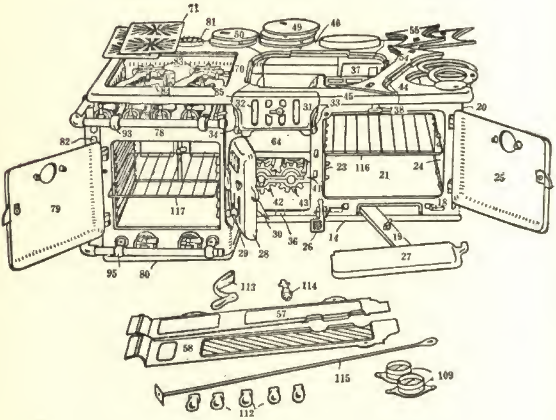
(See illustrations, pages 16 and 18)

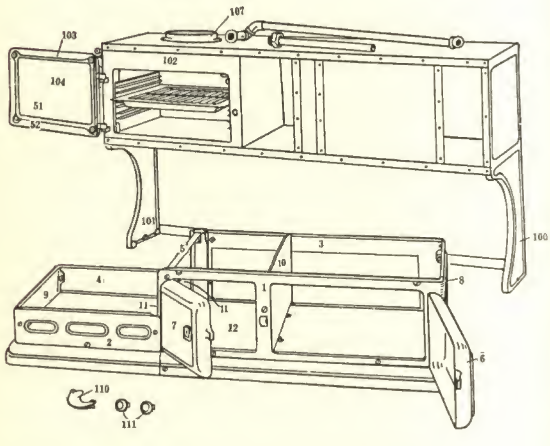
No.	Name of Part	LIST PRICES		
		88	188	288-X
93	Simmering Burner	$1.00	$1.00	$1.00
94	Auto Lighter	3.00	3.00	3.00
95	Burner Support—rear	.80	.80	.80
96	Burner Support—front	.80	.80	.80
97	Long Pipe Bracket	.60	.60	.60
98	Short Pipe Bracket	.50	.50	.50
	ELEVATED GAS			
100	Bracket Right	2.00	2.00	2.00
101	Bracket Left	2.00	2.00	2.00
102	Bracket Stiffener R	1.00	1.00	1.00
103	Bracket Stiffener L	1.00	1.00	1.00
104	Front	8.50	8.50	8.50
105	Oven Door (less Thermometer)	4.80	4.80	4.80
106	Broiler Door	3.60	3.60	3.60
107	End Right	5.00	5.00	4.00
108	End Left	4.80	4.80	4.40
109	Oven Burner	2.50	2.50	2.50
110	Broiler Burner	4.50	4.50	4.50
111	Oven Bottom	3.70	3.60	3.00
112	Oven Bottom Cover			
113	Broiler Bottom	2.20	.....	3.70
114	Broiler Bottom Cover			
115	Oven Sides (each)	.....	2.00	.....
116	Broiler Sides (each)	4.80	.....	6.00
117	Oven Burner Support	.50	.50	.50
118	Broiler Burner Support	.50	.50	.50
119	Oven Slide			
120	Smoke Collar			
121	Short Pipe Bracket (three-quarter inch)	.50	.50	.50
122	Short Pipe Bracket (one-half inch)			
123	Glass Oven Door			
124	Glass Door Frame			
125	Lifter	.40	.40	.40
*126	Door Knob	.20	.20	.20
127	Thermometer	3.00	3.00	3.00
128	Smoke Elbow Frame (288 only)	.....	.....	2.00
129	Smoke Elbow (288 only)	.....	.....	4.50
130	Smoke Elbow Damper (288 only)	.....	.....	4.50

*Shown as 26 on diagram.

428-528 "Perfect" Range

For Coal and Gas Fuels





When ordering parts kindly state:—

1. Number and Letter if any, on Fire Door.
2. Whether Range has Regular or "L" Waterback.
3. If Range is Black, Gray or Blue Enamel.

Double-Oven Combination Ranges

(See illustration, page 20)

No.	Name of Part	LIST PRICES 428	LIST PRICES 528
	CLOSET		
1	Front Right	$3.70	$6.00
2	Front Left	2.20	
3	Back Right	5.00	5.50
4	Back Left	3.00	3.00
5	Stiffener	.40	.40
6	Closet Door	4.00	4.00
7	Ash Door	2.40	2.40
8	End Right	3.50	3.50
9	End Left	2.20	2.20
10	Division Plate	2.20	2.20
11	Wall Plate Extension	1.10	1.10
12	Ash Bottom	3.70	3.70
13	Bottom for Ash Chute	.....	.....
	RANGE		
14	Bottom	9.00	9.50
15	Bottom Flue Strip (under oven)	.50	.50
16	Back	7.00	8.00
17	Back Flue	7.50	7.50
18	Front	6.20	6.50
19	Flue Stopper	.40	.40
20	Right End	5.50	5.50
21	Oven Bottom	3.30	3.80
22	Oven Top	5.00	5.00
23	Oven Front	3.70	3.70
24	Oven Back	2.60	2.60
25	Oven Door Less Thermometer	5.60	6.50
26	Oven Door Kicker	.50	.50
27	Oven Hearth	3.00	3.00
28	Fire Door	3.00	3.00
29	Fire Door Slide	.50	.50
30	Fire Door Ash Chute	.50	.50
31	Feed Door	2.50	2.50
32	Feed Door Slide	.50	.50
33	Feed Door Lug R	.40	.40
34	Feed Door Lug L		
35	Wall Plate (left side of firebox)	6.20	6.20
37	Oven Damper	.70	.70
38	Oven Damper Front Handle	.70	.70
39	Oven Damper Back Handle		
40	Bed Plate	2.00	2.00
41	Grate Frame	1.60	1.60
42	Long Bar	2.50	2.50
43	Short Bar	2.50	2.50
44	Large Top	6.20	6.60
45	Front Top	1.50	2.00
46	Back Top	2.20	2.60
47	Back Top Handhole Cover	.50	.50

Double-Oven Combination Ranges

(See illustration, page 20)

No.	Name of Part	LIST PRICES 428	528
48	Top Slide Damper	$ .50	$ .50
49	Covers, 8 inches	.80	.80
50	Covers, 7 inches	.70	.....
51	Sectional Outer Ring		
52	Sectional Inner Ring	1.00	1.00
53	Sectional Cover Cover		
54	Long Center	1.60	1.60
55	Short Center	.80	.80
56	Brick Clamp	.40	.40
57	Portable Panel R	4.40	4.40
58	Portable Panel L		
59	Waterback	9.25	9.25
60	"L" Waterback	16.00	16.00
61	Waterback Brick	1.90	1.90
62	Sub Brick	1.20	1.20
63	Full Brick	3.00	3.00
64	Front Grate	2.00	2.00
	BODY GAS SECTION		
70	Top	7.00	8.00
71	Top Frets, each	2.00	2.00
72	Solid Top Panels, each	2.00	2.00
73	Solid Top Covers, each	.40	.40
74	Back	10.50	10.50
75	Back Flue	2.00	2.00
76	Waterback Stopper	.....	.....
77	Left End of Range	7.50	7.50
78	Front	4.00	4.50
79	Oven Door less Thermometer	5.50	5.50
80	Bottom of Range	5.50	5.50
81	Smoke Collar	.50	.50
82	Broiler Cock Extension Handle	.50	.50
83	Long Burner	3.50	3.50
84	Large Short Burner	3.00	3.00
85	Small Short Burner	2.50	2.50
86	Simmering Burner	1.00	1.00
87	Rear Burner Support	.80	.80
88	Front Burner Support	.80	.80
89	Oven Burner	2.50	2.50
90	Broiler Burner	4.50	4.50
91	Oven Burner Support	.50	.50
92	Broiler Burner Support	.50	.50
93	Long Pipe Bracket	.60	.60
94	Short Lower Bracket	.50	.50
95	Short Broiler Bracket	.50	.50
	ELEVATED GAS SECTION		
100	Bracket R	6.00	6.00
101	Bracket L	6.00	6.00
102	Front	2.00	2.00

Double-Oven Combination Ranges

(See illustration, page 20)

No.	Name of Part	LIST PRICES 428	528
103	Oven Door	$2.00	$2.00
104	Oven Door Panel	2.00	2.00
105	Broiler Burner	6.50	6.50
106	Broiler Burner Support	.50	.50
107	Smoke Collar	.50	.50
108	Short Pipe Bracket	.50	.50
109	Thermometer	3.00	3.00
110	Elevated Broiler Door Handle	.40	.40
111	Sliding Door Handles	.20	.20
112	Door Handles	.30	.30
113	Shaker	.70	.70
114	Lifter	.40	.40
115	Scraper	.70	.70
116	Coal Oven Rack (wire)	.80	.80
117	Gas Oven Rack	.....	.....

Union Laundry Heaters

(See illustration, page 22)

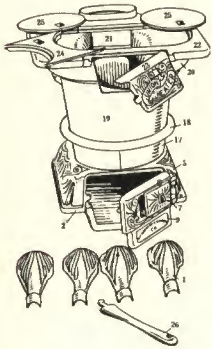
No.	Name of Part	LIST PRICES 1-A	1-B	1-C	4
1	Legs, (each)	$ .80	$ .80	$ .80	.....
2	Base Bottom	4.00	4.00	4.00	$3.00
3	Base Top	4.40	4.40	4.40	4.40
4	Base Side	.....	.....	.....	3.00
5	Base Front	.....	.....	.....	4.40
6	Base Door Complete	1.60	1.60	1.60	3.00
7	Base Door Slide	.40	.40	.40	.....
8	Base Door Flap	.....	.....	.....	.40
9	Base Door Flap Clamp	.....	.....	.....	.40
10	Base Door Flap Ratchet	.....	.....	.....	.40
11	Front Yoke	.....	.....	.....	1.20
12	Back Grate Holder	.....	.....	.....	1.10
13	Grate				
14	Draw Center	1.40	1.40	1.40	.....
15	Long Bar	.....	.....	.....	1.40
16	Short Bars	.....	.....	.....	1.30
17	Brick Pot	.....	3.00	4.00	3.00
18	Brick Pot Ring	.....	2.00	1.50	2.00
19	Water Section	17.00	17.00	.....	17.00
20	Flue (Under top)	4.40	4.40	4.40	4.40
21	Flue Strip	.50	.50	.50	.50
22	Top	4.00	4.00	4.00	4.00
23	Feed Door	1.20	1.20	1.20	1.20
24	Short Center	.80	.80	.80	.80
25	Covers	.80	.80	.80	.80
26	Shaker	.50	.50	.50	.60
	Brick	.....	2.00	2.50	2.50

Laundry and Water Heaters

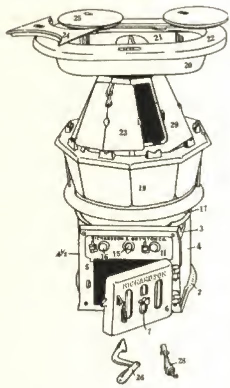
Illustrations will serve as well for most parts of the old types:—

6, 7, 8, 10, 6A, 7A, 8A, 10A, 23, 24,
1, 1A, 1C

No. 1B



No. 40—60—80



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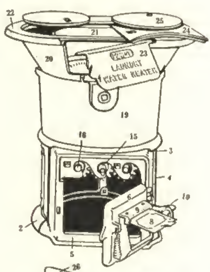


When ordering parts kindly state:—

1. Number of Heater and Letter if any.
2. Whether Water Section is Cast-iron, Galvoxide or Brass.

Laundry and Water Heaters

(See illustration, page 24)

No.	Name of Part	LIST PRICES			
		60	80	40	115
2	Base Bottom	$3.30	$3.30	$3.30	$3.30
3	Base Top	.80	.80	.80	.80
4	Base R Side	1.80	1.80	1.80	1.80
4½	Base L Side	1.80	1.80	1.80	1.80
4¾	Base Back	1.80	1.80	1.80	1.80
5	Base Front	1.20	1.20	1.20	1.20
6	Base Door Complete	2.00	2.00	2.00	2.00
7	Base Door Slide	.50	.50	.50	.50
11	Front Yoke	.50	.50	.50	.50
15	Long Bar	1.70	1.70	1.70	1.70
16	Short Bars	1.40	1.40	1.40	1.40
17	Brick Pot	4.70	4.70	4.70	4.70
18	Upper Brick Pot	.....	.....	5.00	.....
19	Water Section	14.00	22.00	....	29.00
20	Flue (under top)	3.70	3.70	3.70	3.00
21	Flue Strip	.80	.80	.80	.80
22	Top	4.80	4.80	4.80	3.30
23	Cone Door	1.10	1.10	1.10	.....
24	Short Center	.80	.80	.80	.....
25	Covers, (each)	.80	.80	.80	.80
26	Shaker	.60	.60	.60	.60
27	Smoke Collar	.80	.80	.80	.80
28	Lifter	.40	.40	.40	.40
29	Cone Section	9.00	9.00	9.00	.....
	Brick	2.00	2.00	5.00	2.00

No.	Name of Part	LIST PRICES	
		(123B) 123-T	(124B) 124-T
2	Base Bottom	$3.00	$3.00
3	Base Top	4.40	4.40
4	Base Sides	3.00	3.00
5	Base Front	4.40	4.40
6	Base Door Complete	3.00	3.00
8	Base Door Flap	.40	.40
9	Base Door Flap Clamp	.40	.40
10	Base Door Flap Rachet	.40	.40
11	Front Yoke	1.20	1.20
12	Back Grate Holder	1.10	1.10
15	Long Bar	1.40	1.40
16	Short Bar	1.30	1.30
17	Brick Pot and Door	4.70	4.70
18	Brick Pot Door only	.80	.80
19	Water Section	23.00	29.00
20	Flue (Under Top)	5.50	5.50
21	Flue Strip	1.50	1.50
22	Top	3.00	3.00
23	Feed Door	1.20	1.20
23½	Feed Door Frame	.....	.....
24	Short Centre	.80	.80
25	Covers, (each)	1.40	1.40
26	Shaker	.60	.60
27	Smoke Collar	.....	.....
	Brick	2.30	2.30
28	Lifter	.40	.40

Radiation and Heating Specialties

RADIATION and Heating Specialties illustrated and described in the following pages are of well-known manufacture. This is evidenced by the trade names of the different specialties listed.

We carry large stocks of Heating Specialties in our various warehouses, and we are in a position to fill all orders immediately.

Steam and Hot Water Radiator Valves
Automatic Air Valves
Hot Water Heat Intensifiers
Galvanized Expansion Tanks and Brackets
Richardson Red Top Relief Valves
Tank in Basement Hot Water Heating System
"X" Boiler Liquid
Hot Water Thermometers
Ther-Alti Meter
Gauges
Pop Safety Valves
Generators
Excelso Heaters
Taco Heaters
Regulators—Steam and Hot Water

RICHARDSON & BOYNTON CO.

Single Column Plain Radiator

Single Column Plain Radiators

For Steam and Water

No. of Sections	*Length 2½-in. per Sec.	Heating Surface—Square Feet				
		38-in. Height 3 sq. ft. per Sec.	32-in. Height 2½ sq. ft. per Sec.	26-in. Height 2 sq. ft. per Sec.	23-in. Height 1⅔ sq. ft. per Sec.	20-in. Height 1½ sq. ft. per Sec.
2	5	6	5	4	3⅓	3
3	7½	9	7½	6	5	4½
4	10	12	10	8	6⅔	6
5	12½	15	12½	10	8⅓	7½
6	15	18	15	12	10	9
7	17½	21	17½	14	11⅔	10½
8	20	24	20	16	13⅓	12
9	22½	27	22½	18	15	13½
10	25	30	25	20	16⅔	15
11	27½	33	27½	22	18⅓	16½
12	30	36	30	24	20	18
13	32½	39	32½	26	21⅔	19½
14	35	42	35	28	23⅓	21
15	37½	45	37½	30	25	22½
16	40	48	40	32	26⅔	24
17	42½	51	42½	34	28⅓	25½
18	45	54	45	36	30	27
19	47½	57	47½	38	31⅔	28½
20	50	60	50	40	33⅓	30
21	52½	63	52½	42	35	31½
22	55	66	55	44	36⅔	33
23	57½	69	57½	46	38⅓	34½
24	60	72	60	48	40	36
25	62½	75	62½	50	41⅔	37½
26	65	78	65	52	43⅓	39
27	67½	81	67½	54	45	40½
28	70	84	70	56	46⅔	42
29	72½	87	72½	58	48⅓	43½
30	75	90	75	60	50	45

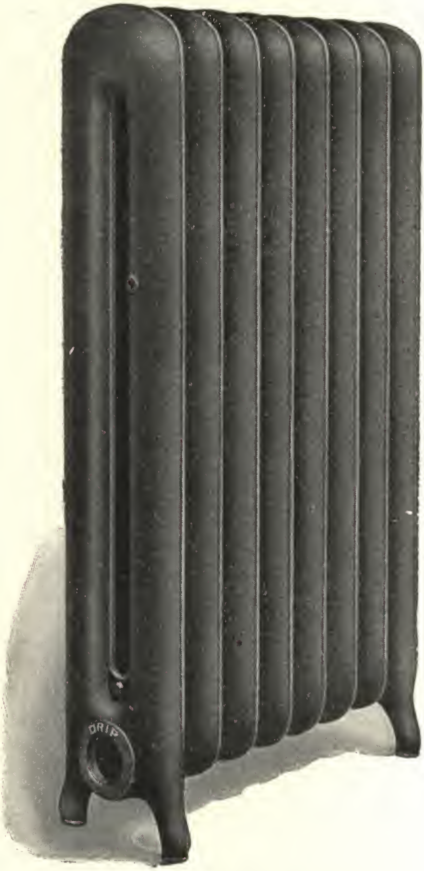
Measurements: Width across section 4½ inches. Width across legs 5 inches. Floor to center of tapping 4½ inches.

*½ inch to be added to length for each bushing.

Connections: Extra-heavy malleable iron slip or threaded nipples. Water radiators require No. 2 slip or threaded nipples at top and bottom. Steam radiators require No. 3 slip or threaded nipples at bottom. For nipple dimensions see page 14.

Drip Hubs: Located on supply leg for one pipe steam. Located on return leg for two pipe steam. Measures 4 inches from center of tapping to floor. Not furnished on water radiation.

Tappings: Steam—2 inches at bottom. Water—1½ inch at top and 2 inches at bottom and bushed to the required size. Air vent tapping ⅛ inch.



Two Column Plain Radiator

Two Column Plain Radiators

For Steam and Water

No. of Sec-tions	*Length 2½-in. per Sec.	Heating Surface—Square Feet					
		45-in. Height 5 sq. ft. per Sec.	38-in. Height 4 sq. ft. per Sec.	32-in. Height 3⅓ sq. ft. per Sec.	26-in. Height 2⅔ sq. ft. per Sec.	23-in. Height 2⅓ sq. ft. per Sec.	20-in. Height 2 sq. ft. per Sec.
2	5	10	8	6⅔	5⅓	4⅔	4
3	7½	15	12	10	8	7	6
4	10	20	16	13⅓	10⅔	9⅓	8
5	12½	25	20	16⅔	13⅓	11⅔	10
6	15	30	24	20	16	14	12
7	17½	35	28	23⅓	18⅔	16⅓	14
8	20	40	32	26⅔	21⅓	18⅔	16
9	22½	45	36	30	24	21	18
10	25	50	40	33⅓	26⅔	23⅓	20
11	27½	55	44	36⅔	29⅓	25⅔	22
12	30	60	48	40	32	28	24
13	32½	65	52	43⅓	34⅔	30⅓	26
14	35	70	56	46⅔	37⅓	32⅔	28
15	37½	75	60	50	40	35	30
16	40	80	64	53⅓	42⅔	37⅓	32
17	42½	85	68	56⅔	45⅓	39⅔	34
18	45	90	72	60	48	42	36
19	47½	95	76	63⅓	50⅔	44⅓	38
20	50	100	80	66⅔	53⅓	46⅔	40
21	52½	105	84	70	56	49	42
22	55	110	88	73⅓	58⅔	51⅓	44
23	57½	115	92	76⅔	61⅓	53⅔	46
24	60	120	96	80	64	56	48
25	62½	125	100	83⅓	66⅔	58⅓	50
26	65	130	104	86⅔	69⅓	60⅔	52
27	67½	135	108	90	72	63	54
28	70	140	112	93⅓	74⅔	65⅓	56
29	72½	145	116	96⅔	77⅓	67⅔	58
30	75	150	120	100	80	70	60

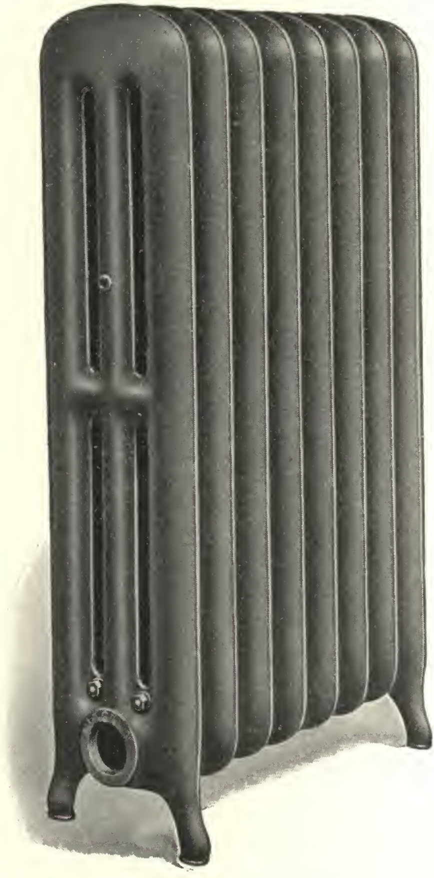
Measurements: Width across section 7⅜ inches. Width across legs 7¾ inches. Floor to center of tapping 4½ inches.

*½ inch to be added to length of radiator for each bushing.

Connections: Extra-heavy malleable iron slip or threaded nipples. Water radiators require No. 2 slip or threaded nipples at top and bottom. Steam radiators require No. 3 slip or threaded nipples at bottom. For nipple dimensions see page 14.

Drip Hubs: Located on supply leg for one pipe steam. Located on return leg for two pipe steam. Measures 4 inches from center of drip hub to floor. Not furnished on water radiation.

Tappings: Steam—2 inches at bottom. Water—1½ inch at top and 2 inches at bottom and bushed to the required size. Air vent tapping ⅛ inch.



Three Column Plain Radiator

Three Column Plain Radiators

For Steam and Water

No. of Sections	*Length 2½-in. per Sec.	Heating Surface—Square Feet					
		45-in. Height 6 sq. ft. per Sec.	38-in. Height 5 sq. ft. per Sec.	32-in. Height 4½ sq. ft. per Sec.	26-in. Height 3¾ sq. ft. per Sec.	22-in. Height 3 sq. ft. per Sec.	18-in. Height 2¼ sq. ft. per Sec.
2	5	12	10	9	7½	6	4½
3	7½	18	15	13½	11¼	9	6¾
4	10	24	20	18	15	12	9
5	12½	30	25	22½	18¾	15	11¼
6	15	36	30	27	22½	18	13½
7	17½	42	35	31½	26¼	21	15¾
8	20	48	40	36	30	24	18
9	22½	54	45	40½	33¾	27	20¼
10	25	60	50	45	37½	30	22½
11	27½	66	55	49½	41¼	33	24¾
12	30	72	60	54	45	36	27
13	32½	78	65	58½	48¾	39	29¼
14	35	84	70	63	52½	42	31½
15	37½	90	75	67½	56¼	45	33¾
16	40	96	80	72	60	48	36
17	42½	102	85	76½	63¾	51	38¼
18	45	108	90	81	67½	54	40½
19	47½	114	95	85½	71¼	57	42¾
20	50	120	100	90	75	60	45
21	52½	126	105	94½	78¾	63	47¼
22	55	132	110	99	82½	66	49½
23	57½	138	115	103½	86¼	69	51¾
24	60	144	120	108	90	72	54
25	62½	150	125	112½	93¾	75	56¼
26	65	156	130	117	97½	78	58½
27	67½	162	135	121½	101¼	81	60¾
28	70	168	140	126	105	84	63
29	72½	174	145	130½	108¾	87	65¼
30	75	180	150	135	112½	90	67½

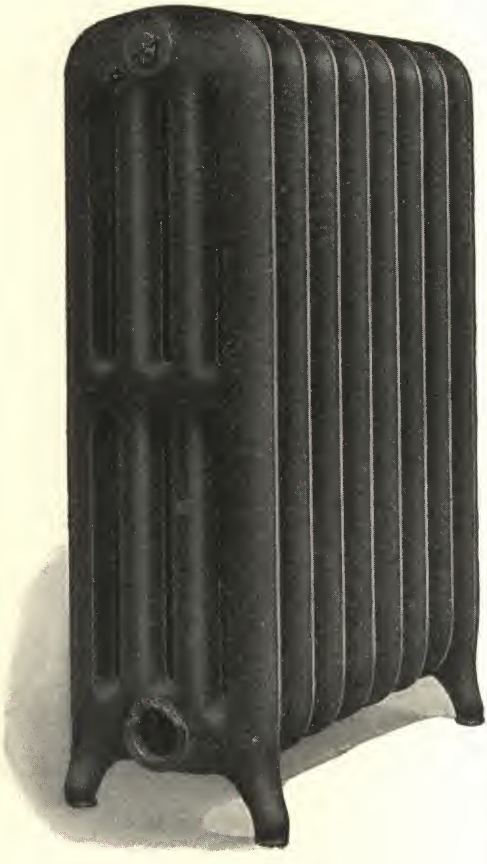
Measurements: Width across section 9 inches. Width across legs 9½ inches. Floor to center of tapping 4½ inches.

*½ inch added to length of radiator for each bushing.

Connections: Extra-heavy malleable iron slip or threaded nipples. Water radiators require No. 2 slip or threaded nipples at top and bottom. Steam radiators require No. 3 slip or threaded nipples at bottom. For nipple dimensions see page 14.

Drip Hubs: Located on supply leg for one pipe steam. Located on return leg for two pipe steam. Measures 4 inches from center of tapping to floor. Not furnished on water radiation.

Tappings: Steam—2 inches at bottom. Water—1½ inch at top and 2 inches at bottom and bushed to the required size. Air vent tapping ⅛ inch.



Four Column Plain Radiator

Four Column Plain Radiators

For Steam or Water

No. of Sections	*Length 3-in. per Sec.	Heating Surface—Square Feet					
		45-in. Height 10sq.ft. per Sec.	38-in. Height 8 sq. ft. per Sec.	32-in. Height 6½ sq.ft. per Sec.	26-in. Height 5 sq. ft. per Sec.	22-in. Height 4 sq. ft. per Sec.	18-in. Height 3 sq. ft. per Sec.
2	6	20	16	13	10	8	6
3	9	30	24	19½	15	12	9
4	12	40	32	26	20	16	12
5	15	50	40	32½	25	20	15
6	18	60	48	39	30	24	18
7	21	70	56	45½	35	28	21
8	24	80	64	52	40	32	24
9	27	90	72	58½	45	36	27
10	30	100	80	65	50	40	30
11	33	110	88	71½	55	44	33
12	36	120	96	78	60	48	36
13	39	130	104	84½	65	52	39
14	42	140	112	91	70	56	42
15	45	150	120	97½	75	60	45
16	48	160	128	104	80	64	48
17	51	170	136	110½	85	68	51
18	54	180	144	117	90	72	54
19	57	190	152	123½	95	76	57
20	60	200	160	130	100	80	60
21	63	210	168	136½	105	84	63
22	66	220	176	143	110	88	66
23	69	230	184	149½	115	92	69
24	72	240	192	156	120	96	72
25	75	250	200	162½	125	100	75
26	78	260	208	169	130	104	78
27	81	270	216	175½	135	108	81
28	84	280	224	182	140	112	84
29	87	290	232	188½	145	116	87
30	90	300	240	195	150	120	90

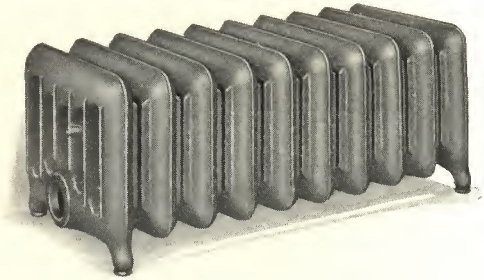
Measurements: Width across section 11½ inches. Width across legs 12 inches. Floor to center of tapping 4½ inches.

*½ inch to be added to length of radiator for each bushing.

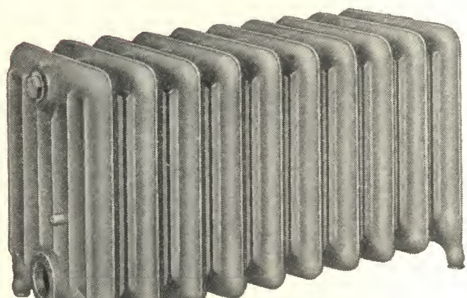
Connections: Extra-heavy malleable iron slip or threaded nipples. No. 2 slip or threaded nipples at top and No. 3 slip or threaded nipples at bottom. For nipple dimensions see page 14.

Drip Hubs: Not furnished on this pattern. Eccentric bushings furnished instead.

Tappings: Are 1½ inch at top and 2 inches at bottom, and bushed to the required size. Air vent tapping ⅛ inch.



Six Column Radiator
12 Inches High—Steam Only



Six Column Radiator
17 Inches High—Steam or Water

Six Column Plain Radiators

For Steam or Water

No. of Sections	*Length 3 inches per Section	20-in. Height 5 sq. ft. per Section	17-in. Height 4 sq. ft. per Section	‡14-in. Height 3¼ sq. ft. per Section	†12-in. Height 3 sq. ft. per Section
2	6	10	8	6½	6
3	9	15	12	9¾	9
4	12	20	16	13	12
5	15	25	20	16¼	15
6	18	30	24	19½	18
7	21	35	28	22¾	21
8	24	40	32	26	24
9	27	45	36	29¼	27
10	30	50	40	32½	30
11	33	55	44	35¾	33
12	36	60	48	39	36
13	39	65	52	42¼	39
14	42	70	56	45½	42
15	45	75	60	48¾	45
16	48	80	64	52	48
17	51	85	68	55¼	51
18	54	90	72	58½	54
19	57	95	76	61¾	57
20	60	100	80	65	60
21	63	105	84	68¼	63
22	66	110	88	71½	66
23	69	115	92	74¾	69
24	72	120	96	78	72
25	75	125	100	81¼	75
26	78	130	104	84½	78
27	81	135	108	87¾	81
28	84	140	112	91	84
29	87	145	116	94¼	87
30	90	150	120	97½	90

†12-inch pattern furnished only in Steam and assembled with slip nipples.
‡14-inch pattern furnished only with slip nipples.

Measurements: Width across section 12½ inches. Width across legs 12½ inches. Floor to center of tapping 3 inches.

*½ inch to be added to length of radiator for each bushing.

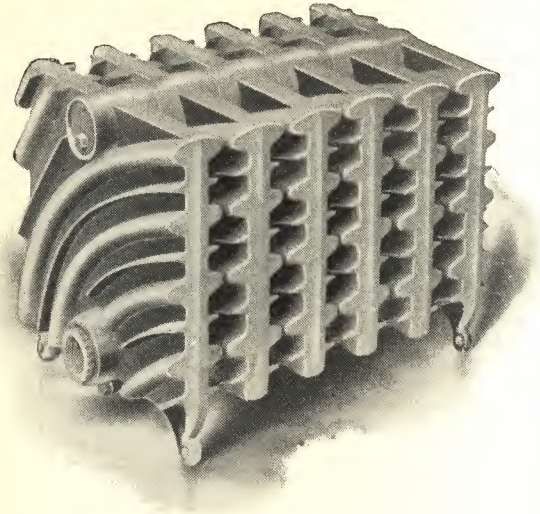
Connections: Extra-heavy malleable iron slip or threaded nipples furnished on 17-inch and 20-inch patterns. The 12-inch and 14-inch only with slip nipples.

The 14-inch, 17-inch, 20-inch require the No. 1 nipples at the top and the No. 3 nipples at the bottom. The 12-inch requires the No. 3 nipple. For nipple dimensions see page 14.

Drip Hubs are not furnished in this pattern. Eccentric bushings are furnished instead.

Tappings are 1½ inch at top and 2 inches at bottom for 14-inch, 17-inch, 20-inch patterns and 2 inches at bottom only for 12-inch pattern.

Air vent tapping ⅛ inch.



Window Seat Radiator

Special attention should be given this, the only efficient Window Seat Radiator on the market.

The heated air is carried by natural gravitation forward over the curved flues out into the room which forces positive circulation. It is the only seat radiator which can be relied upon to function up to its rating.

All Radiators will be assembled with malleable iron push nipples unless specified screw nipples.

Extra-Heavy Malleable Iron Slip Nipples

Outside Diameter

No. 1 Nipple.......... $1\frac{3}{4}$ inches
No. 2 Nipple.......... $1\frac{15}{16}$ inches
No. 3 Nipple.......... $2\frac{7}{32}$ inches

Extra-Heavy Malleable Iron Right and Left Threaded Nipples

Outside Diameter

No. 1 Nipple.......... $1\frac{3}{4}$ inches
No. 2 Nipple.......... 2 inches
No. 3 Nipple.......... $2\frac{1}{4}$ inches

Window Seat Radiators

For Steam or Water

Number of Sections	* Length, 3 Inches per Section	Heating Surface in Square Feet 14 In. Height, 4 Sq. Ft. per Sec.
2	6	8
3	9	12
4	12	16
5	15	20
6	18	24
7	21	28
8	24	32
9	27	36
10	30	40
11	33	44
12	36	48
13	39	52
14	42	56
15	45	60
16	48	64
17	51	68
18	54	72
19	57	76
20	60	80
21	63	84
22	66	88
23	69	92
24	72	96

Measurements: Width across section 13 inches. Width across legs 13 inches. Floor to center of tapping 3 inches.

*½ inch to be added to length of radiator for each bushing.

Connections: No. 2 extra-heavy malleable iron slip nipples at top and bottom are used in this pattern. For nipple dimensions see page 14.

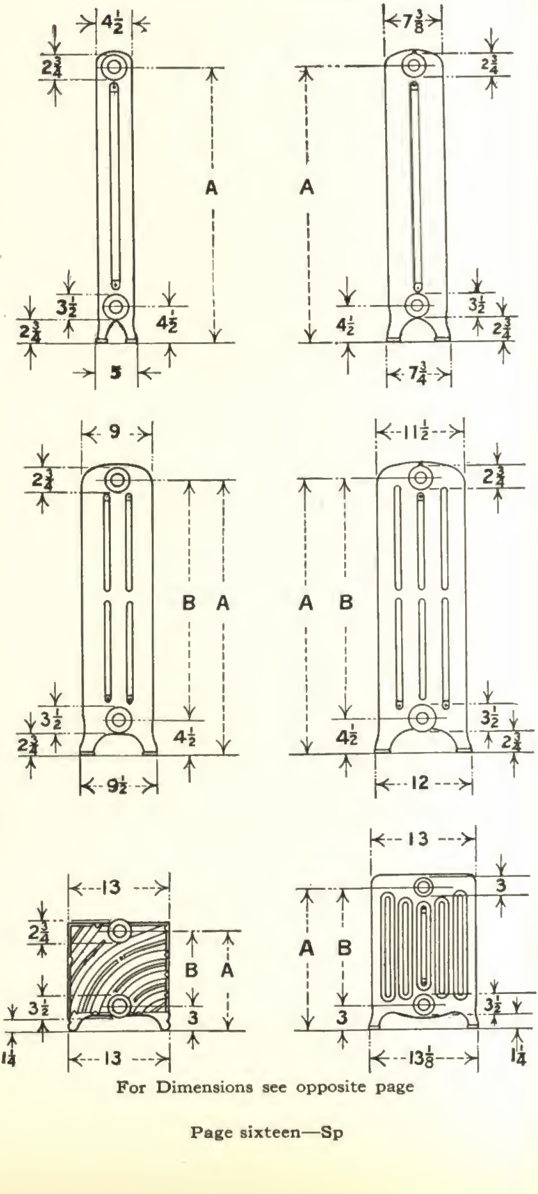
Drip Hubs: Not furnished on this pattern. Eccentric bushings are furnished instead.

Tappings are 1½ inch at top and 2 inches at bottom and bushed to the required size.

Air vent tapping ⅛ inch.

Note—In case new end sections are needed, be sure to state if it is the right or left end section as you face the front of the radiator.

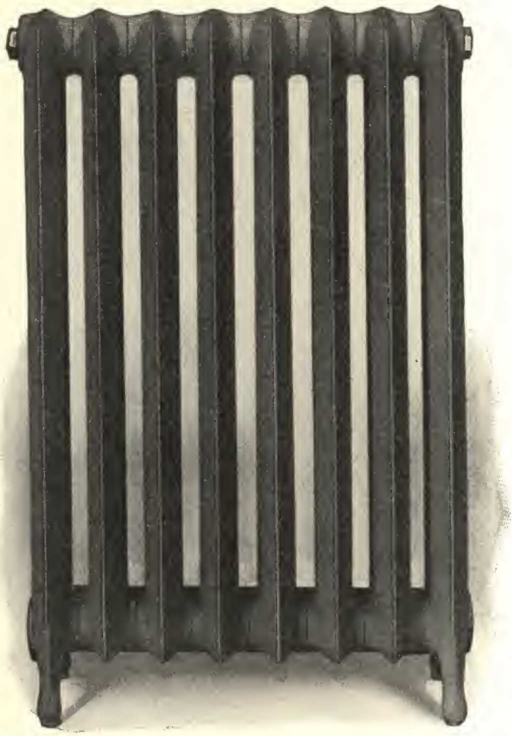
Radiator Dimensions



For Dimensions see opposite page

Dimensions for Etchings Shown on Opposite Page

Kind of Radiator	Height of Radiator	A	B
Single Column	20″	$17\frac{61}{64}$	$13\frac{29}{64}$
	23″	$20\frac{61}{64}$	$16\frac{29}{64}$
	26″	$23\frac{59}{64}$	$19\frac{27}{64}$
	32″	$29\frac{63}{64}$	$25\frac{31}{64}$
	38″	$35\frac{15}{16}$	$31\frac{28}{64}$
Two Column	20″	$17\frac{61}{64}$	$13\frac{29}{64}$
	23″	$20\frac{63}{64}$	$16\frac{31}{64}$
	26″	$23\frac{59}{64}$	$19\frac{27}{64}$
	32″	$29\frac{63}{64}$	$25\frac{31}{64}$
	38″	$35\frac{15}{16}$	$31\frac{28}{64}$
	45″	$42\frac{63}{64}$	$38\frac{31}{64}$
Three Column	18″	$15\frac{55}{64}$	$11\frac{23}{64}$
	22″	$19\frac{7}{8}$	$15\frac{24}{64}$
	26″	$23\frac{59}{64}$	$19\frac{27}{64}$
	32″	$29\frac{63}{64}$	$25\frac{31}{64}$
	38″	$35\frac{15}{16}$	$31\frac{28}{64}$
	45″	$42\frac{63}{64}$	$38\frac{31}{64}$
Four Column	18″	$15\frac{55}{64}$	$11\frac{23}{64}$
	22″	$19\frac{7}{8}$	$15\frac{24}{64}$
	26″	$23\frac{59}{64}$	$19\frac{27}{64}$
	32″	$29\frac{63}{64}$	$25\frac{31}{64}$
	38″	$35\frac{15}{16}$	$31\frac{28}{64}$
	45″	$42\frac{63}{64}$	$38\frac{31}{64}$
Six Column	12″		
	14″	$12\frac{1}{8}$	$9\frac{1}{8}$
	17″	$15\frac{1}{8}$	$12\frac{1}{8}$
	20″	$18\frac{1}{8}$	$15\frac{1}{8}$
Window Seat	14″	13	10



Two Column Hospital Radiator

Made for Steam or Water

One Column sections	4½″	wide and 3″	on centers.
Two Column sections	7⅜″	wide and 3″	on centers.
Three Column sections	9″	wide and 3″	on centers.
Four Column sections	11½″	wide and 3½″	on centers.

Connections: Either extra-heavy malleable iron slip or threaded right and left nipples at top and bottom, using same size of Nipples as in the Standard 1-2-3-4 column patterns.

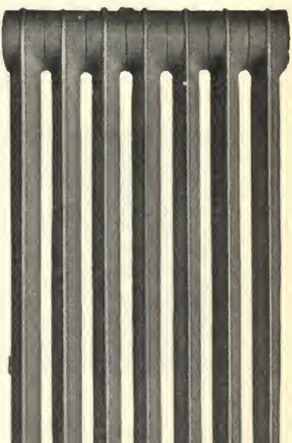
Tappings are 1½ inch at top and 2 inches at bottom, and bushed to required size.

Air vent tapping ⅛ inch.

Plain Wall Radiator Sections

No. 7-V

This simple and attractive pattern of Wall radiation displays a distinctive character in its design. When the sections are assembled they present the appearance of a continuous radiator, making a perfect unit without showing broken joints where connections are made.



No. 9-V

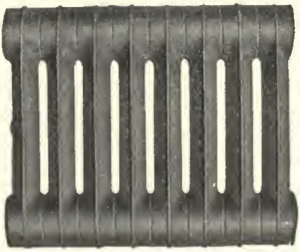
The circulation is perfect, with the greatest volume of air space, thus assuring the highest efficiency.

They are connected with $1\frac{1}{2}$-inch right and left threaded internal screw nipples.

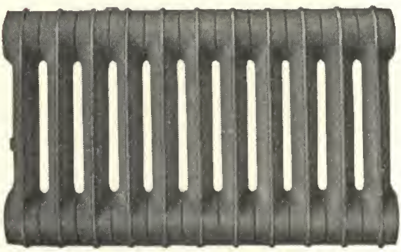
For ratings and measurements, see page 20.

For additional measurements, methods of assembling, and directions in ordering, see pages 22 to 24 inclusive.

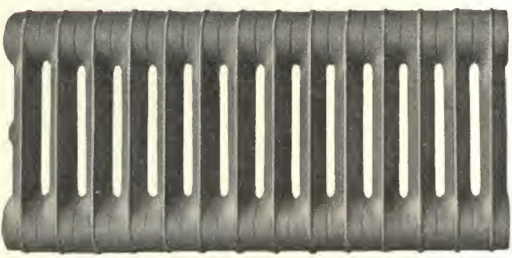
Plain Wall Radiator Sections



No. 5-H



No. 7-H

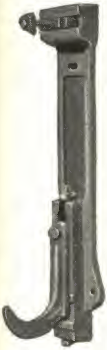


No. 9-H

Ratings and Measurements

Section Numbers	Height Inches	Length or Width Inches	Thickness Inches	Thickness With Brackets Inches	Heating Surface Sq. Ft.
5-H	13⅞	16	3	3¾	5
7-H	13⅞	22	3	3¾	7
9-H	13⅞	28	3	3¾	9
7-V	21¼	14	3	3¾	7
9-V	27⅛	14	3	3¾	9

Wall Radiator Brackets



No. 15

No. 6

No. 8

No. 5

No. 9

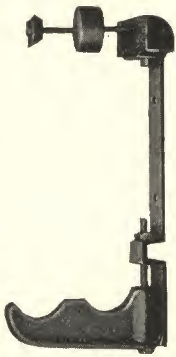
No. 10

All Iron

Wall

No. 20

Steel and Iron



No. 21

Rigid Brackets

Nos. 6-8-9-10

Instructions for installing Rigid Brackets.

Radiators of	1 to 6	sections inclusive—	2	top	and	2	bottom
"	"	7 to 10	"	"	3	"	"	3	"

Radiators of		1 to 6	sections	inclusive—	2	top	and	2	bottom
"	"	7 to 10	"	"	3	"	"	3	"
"	"	11 to 15	"	"	4	"	"	4	"

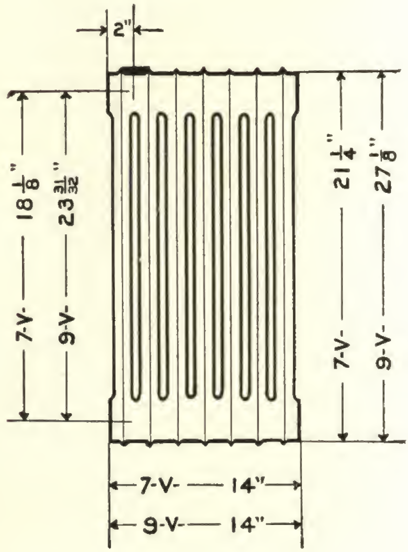
Adjustable Expansion Brackets

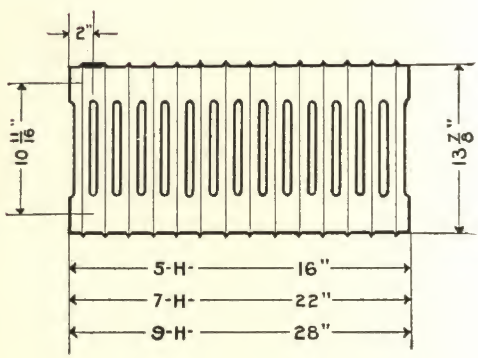
Nos. 15-20-21

Instructions for installing Adjustable Expansion Brackets.

Radiators of		1 to 10	sections	inclusive—	2	brackets
"	"	11 to 15	"	"	3	"
"	"	16 to 20	"	"	4	"
"	"	21 to 25	"	"	5	"

Wall Radiator Measurements





Wall Radiator Measurements *(Continued)*

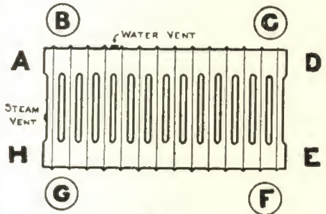


FIG-1

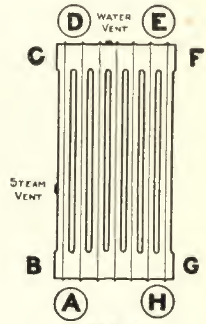


FIG-2

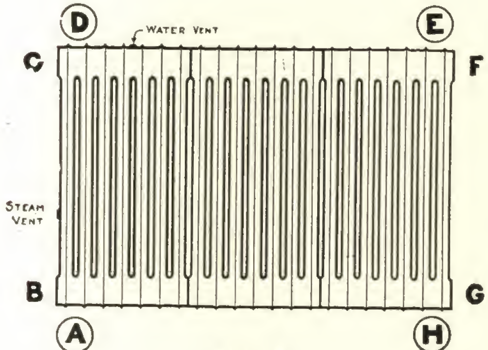


FIG-3

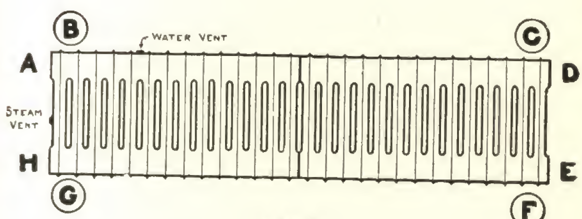


FIG-6

Letters in Circles are Special Tappings for which there is an Extra Charge.

Wall Radiator Measurements *(Continued)*

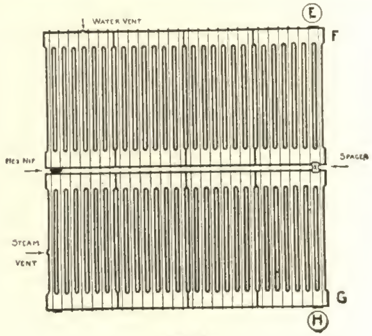


FIG-12

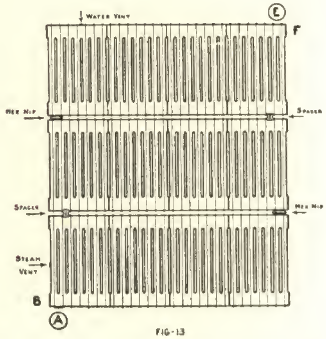


FIG-13

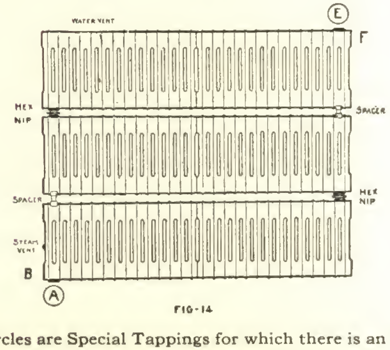


FIG-14

Letters in Circles are Special Tappings for which there is an Extra Charge.

Tappings of Direct Radiators

Steam Radiators

One Pipe Installations

Up to 24 square feet, inclusive	1 inch
Above 24, up to 60 square feet, inclusive	1¼ inch
Above 60, up to 100 square feet, inclusive	1½ inch
Above 100 square feet	2 inch

Two-Pipe Work—Supply and Return

Up to 48 square feet, inclusive	1 x ¾ inch
Above 48, up to 96 square feet, inclusive	1¼x1 inch
Above 96 square feet	1½x1¼ inch

Water Radiators

Up to 40 square feet, inclusive	1 x1 inch
Above 40, up to 72 square feet, inclusive	1¼x1¼ inch
Above 72 square feet	½x1½ inch

All air valve tappings for Direct Radiators are made ⅛ inch.

Radiators for "Richardson" Vapor Vacuum-Pressure Systems

All radiators to be tapped top and bottom same end, excepting radiators exceeding in length two and one-half times the height, in which case tappings shall be top and bottom opposite ends.

Up to 50 square feet, inclusive	½x ½ inch
Above 50, up to 110 square feet, inclusive	¾x ½ inch
Above 110 square feet	1 x ½ inch

Threads of Openings

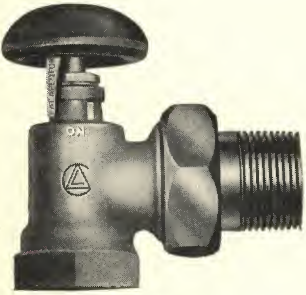
Unless otherwise specified all openings of Direct Radiators will have right hand threads—excepting Wall Radiators, which are tapped 1½ inch right hand on one end and 1½ inch left hand on the other end.

"Genuine Detroit" Steam and Hot Water Radiator Valves

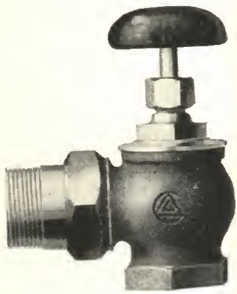
Packed Types

All "Genuine Detroit" Radiator Valves, packed types, are now equipped with a new kind of non-breakable, non-heat-conducting, round handle, handsome in appearance and with permanent black, hard-rubber finish.

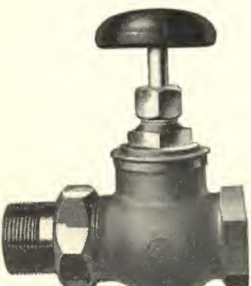
Because the rough use of a wrench on polished nickel plated surfaces tends to flake off the nickel and leave the finish marred, it has been decided to supply all packed types of Detroit Radiator Valves, with the exception of No. 373 Gate, with body hexes in the same satin nickel finish as the rest of the bodies.



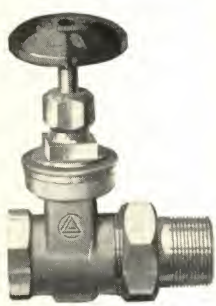
No. 101
Quick Opening, Union Angle for Hot Water



No. 72
Screw Stem, Union Angle for Steam

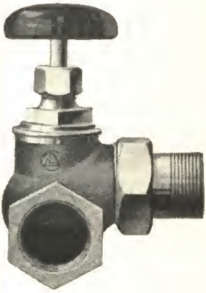


No. 57
Union Globe for Steam

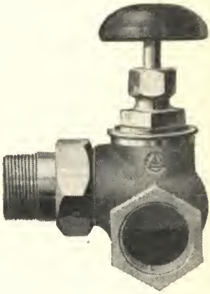


No. 373
Union Gate for Steam and Hot Water

Detroit Steam and Hot Water Radiator Valves

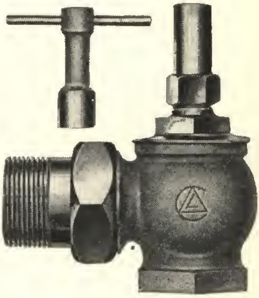


No. 32
R. H. Corner Union for Steam



No. 37
L. H. Corner Union for Steam

No. 132
Union Elbow



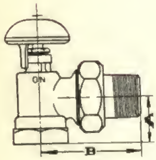
With Lock and Shield

List Prices

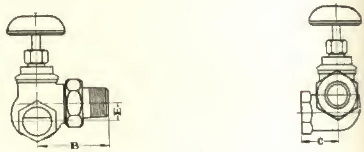
No.		½ In.	¾ In.	1 In.	1¼ In.	1½ In.	2 In.
72	Steam Angle with union, composition disc	$3.70	$4.30	$5.10	$6.40	$8.40	$13.60
62	Steam Angle with union, brass disc	4.30	4.90	5.85	7.15	9.40	14.85
101	Hot Water Angle with union	3.25	3.70	4.50	5.75	7.30	12.00
132	Union Ells	1.75	2.00	2.50	3.30	4.25	7.20
32	Steam Right Hand Corner with union, composition disc	4.10	4.75	5.60	7.05	9.25	15.00
37	Steam Left Hand Corner with union, composition disc	4.10	4.75	5.60	7.05	9.25	15.00
57	Globe, with union	3.70	4.30	5.10	6.40	8.40	13.60
373	Radiator Gates with union	3.65	4.25	5.20	6.60	9.00	12.80

Detroit Steam and Hot Water Radiator Valves

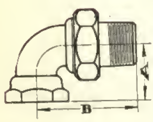
Roughing-in Dimensions



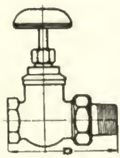
Angle



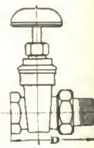
Corner



Union Elbow



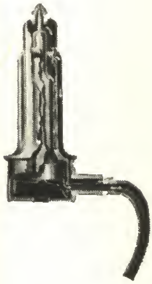
Globe



Gate

No.			½ In.	¾ In.	1 In.	1¼ In.	1½ In.	2 In.
72	Steam Angle with union, composition disc	A	1	1¼	1⅜	1⅝	1 13/16	2 3/16
		B	2⅜	2⅝	3 1/16	3⅜	3 11/16	4 5/16
62	Steam Angle with union, brass disc	A	1	1¼	1⅜	1⅝	1 13/16	2 3/16
		B	2⅜	2⅝	3 1/16	3⅜	3 11/16	4 5/16
101	Hot Water Angle with union	A	1	1¼	1⅜	1⅝	1 13/16	2⅜
		B	2⅜	2⅝	3 1/16	3⅜	3 11/16	4 7/16
132	Union Ell	A	1⅜	1⅜	1 11/16	1 15/16	2 5/16	2⅝
		B	2 7/16	2⅝	3	3 7/16	4	4 7/16
32	Steam Right Hand Corner with union, composition disc	B	2 9/16	2 25/32	3 3/32	3¾	3 15/16	4 9/16
		E	21/32	25/32	25/32	15/16	1⅛	1⅝
		C	1 5/16	1 7/16	1 11/16	1⅞	2 3/16	2 9/16
37	Steam Left Hand Corner with union, composition disc	B	2 9/16	2 25/32	3 3/32	3¾	3 15/16	4 9/16
		E	21/32	25/32	25/32	15/16	1⅛	1⅝
		C	1 5/16	1 7/16	1 11/16	1⅞	2 3/16	2 9/16
57	Globe with union	D	3⅝	3 15/16	4¾	5 5/16	5 23/32	6 27/32
373	Radiator Gates with union	D	3 9/16	3 9/16	4	4 9/16	5⅛	5 13/16

Hoffman Air Valves

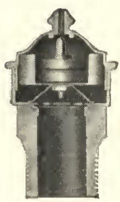


The No. 1 Hoffman Siphon Air Valve, automatic—non-adjustable. The only "Perfect" Air Valve.

The Hoffman Syphon Air Valve perfectly and effectively distinguishes between steam and air and between water and air, closing tight against steam or water, but freely venting all the air from the radiator, no matter whether the air is hot or cold.

It is of all metal construction and in common with all Hoffman Valves, is guaranteed for 5 years.

List price $1.90

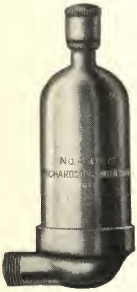


The No. 4 Quick Vent Valve is designed for use in venting risers or return mains where water will not come in contact with the valve. All air is freely vented through a ⅛-inch vent port without loss of steam, although valve will not prevent escape of water.

Standard connection is ¾ inch, although this can be furnished ¼ inch if so desired.

List price $2.80

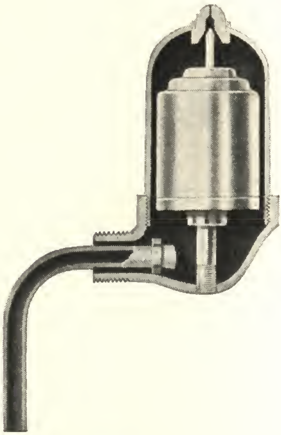
The "Richardson" No. 4 Gem Adjustable Steam Air Valve



The cheapest highgrade Air Valve on the market. Efficient, low in cost and suitable for all classes of steam heating systems.

List price . . . . $ .60

The "Warco" Non-adjustable Radiator Air Valve



The "Warco" is an all-metal valve. It is automatic, absolutely non-adjustable, incapable of being tampered with, and operates under all pressures, permitting steam to heat every part of the radiator.

Guaranteed for five years

List price $1.25

The Clow Temperature "Booster"

A-6915
Clow Temperature "Booster"

What It Is

The *Clow Temperature "Booster"* is a device which creates, by pressure, a quick and vigorous circulation of water in a hot water heating system. As soon as the water begins to warm, expansion takes place. The "*Booster*" confines the hot water to the system thus creating and maintaining a pressure until a total of ten pounds, plus that due to the elevation of the water, is on the entire system.

Operation

The *Clow Temperature "Booster"* is instantaneous in operation; as soon as the water in the system begins to warm and expand simultaneously the "*Booster*" exerts its pressure. As the temperature of the water increases, it expands until it overcomes the weight of the valve (ten pounds) and it is lifted from its seat, as shown in Plate A-6916, permitting the water to pass through to the expansion tank. When the temperature of the water in the system decreases and contracts the valve takes its seat, the water returning to the system through the check valve, as shown in Plate A-6917.

Description

Briefly, the *Clow Temperature "Booster"* consists of a cast iron shell tapped one inch for connection with both the expansion tank and the system. Within this shell is a weight containing in its lower half a check valve of the ball type. The bottom of this weight is provided with a hard rubber disc, resting on a red brass seat.

The bearings of these valves on the seats are very small and they are guaranteed against corrosion and leakage. A guide in the top of the weight travels in a corresponding boring of the cap.

The Clow Temperature "Booster"

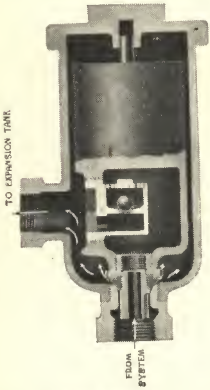


Plate A-6916

Shows the *Clow Temperature "Booster"* with the water passing from the system to the expansion tank

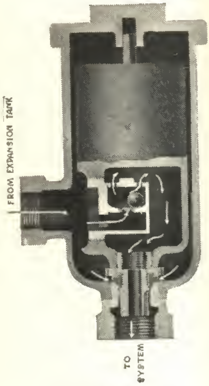


Plate A-6917

Shows the *Clow Temperature "Booster"* with the water passing from the expansion tank to the system

The *Temperature "Booster"* is simple in its construction—there are no parts that can get out of order—is thoroughly guaranteed in every respect and requires no attention whatever.

In designing a system to operate under the *Clow Temperature "Booster*," figure the radiation the same as for the gravity or open tank system, then deduct ten per cent from the radiation and use pipe one size smaller throughout, leaving the boiler capacity the same as for a gravity system.

It may be cited that in reducing the quantity of radiation and the sizes of pipe, the valve and elbows are likewise reduced in size, effecting a saving in these items of construction.

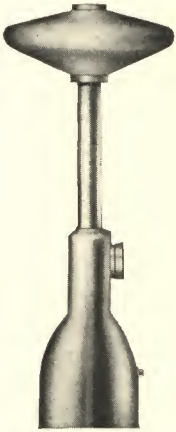
The "*Booster*" can be applied to old unsatisfactory heating systems, increasing their efficiency and saving the installation of a new boiler or an increase in radiation.

Dimensions and List Price

Diameter, inches	3¼
Height, inches	11¼
Inlet and Outlet, inch	1
List price	$14.00

The "*Booster*" is for use on the ordinary system where the expansion tank is placed above the highest radiator.

Honeywell Heat Generators



For Hot Water Heating Outfits

These Generators are designed to meet the demand for a device to quicken the circulation in hot water heating jobs. When connected to the piping of an ordinary gravity plant this Generator seals the circuit and permits the generation of a slight pressure up to ten pounds, at which point it relieves itself through the operation of a mercury seal, eliminating the element of danger. The tendencies of this slight pressure are: first, to increase the circulation; second, to widen the range of temperatures to a point equal to that of steam; third, to accomplish an economy in fuel.

The pressure created by this Generator is calculated to force the water through any part of a defective piping system where the circulation is sluggish under ordinary gravity conditions. It is simple to install and is applicable to both old and new heating plants.

Approximate weights: style 1, 35 pounds; style 2, 45 pounds; style 3, 55 pounds.

List prices, each

Style 1 for 1,200 square feet	$25.00
Style 2 for 2,500 square feet	35.00
Style 3 for 3,500 square feet	50.00

Galvanized Expansion Tanks

These tanks are made of steel, heavily galvanized, and are good for full rated capacity.

Tapping: These tanks are tapped top and bottom for 1-inch overflow and expansion pipe, and on side for feed pipe.

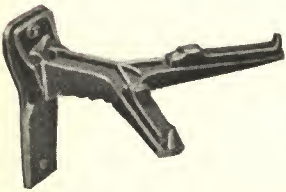
Water Gauge Tappings—½ inch—13½ inches between centers.

Water Gauge. List price $1.75. Weight, packed, 1¾ pounds.

List Prices for Tanks

Style	Size Inches	Nominal Capacity Gallons	Square Feet of Radiation	Price of Tank	Weight of Tank Pounds
1	12x20	10	300	$ 8.00	34
2	12x30	15	500	9.00	47
3	14x30	20	700	12.50	55
4	16x30	26	950	14.00	71
5	16x36	32	1300	15.00	78
6	16x48	42	2000	16.50	93

Expansion Tank Bracket



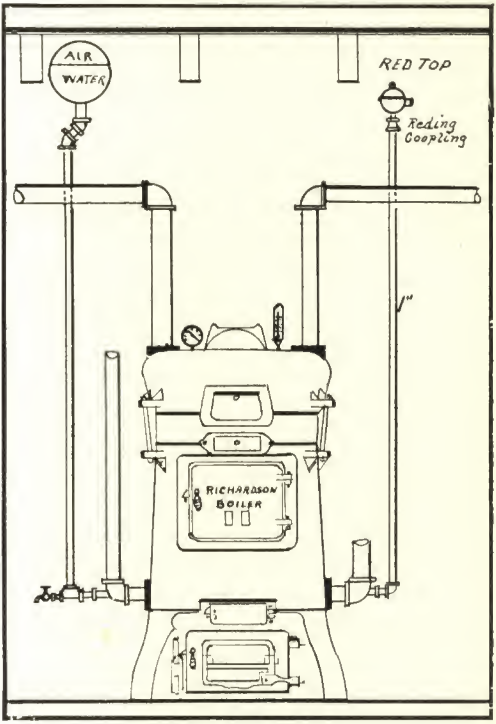
Takes in all sizes of tanks, from 10 to 16 inches diameter. Labor-saving—can be erected in two minutes. A substitute for the old-fashioned shelf at less expense. Weighs about 6½ pounds and is shipped with screws packed under the slide pieces.

List price, each, complete

$1.75

Tank-in-Basement Hot Water Heating System with the use of the

No. 2 Richardson Red Top Relief Valve



List Price of No. 2 Red Top Relief Valve only........ $15.00

Schedule of Tank Capacities used with this system

Sq. ft. of Radiation	Gallons
Up to 500	15
From 500 to 800	21
From 800 to 1200	27
From 1200 to 1600	42
Above 1600	60

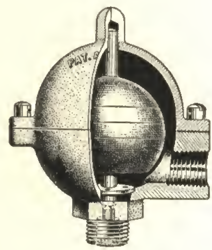
No. 1 Richardson Red Top Water Relief Valve

Cast bronze casing, lead ball, monel metal spindle. Operates at 50 pounds pressure. Always responds in the emergency.

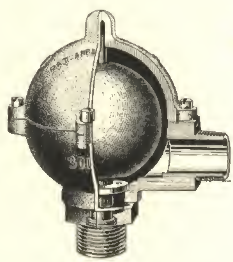
Should be used on every domestic hot water supply system.

Additional discs are supplied, packed in each box to allow setting at 60 or 70 pounds pressure.

Guarantee: If a Red Top Relief Valve (set at 50 pounds) is used on any "*Richardson*" Water Supply heater, we will guarantee it against pressure breaks.



List price $6.00



No. 2 Red Top Water Relief Valve for use on hot water heating systems for protection of boilers.

List price $15.00

"X" Boiler Liquid

"X" Boiler Liquid is a scientific process, patented some years ago, for automatically finding and permanently repairing leaks in steam and hot water heaters. "X" is as widely known in the steamfitting trade as the Kodak is in the photographic field. "X" eliminates the necessity of dismantling, or shutting off heat. When poured into the system, it immediately combines with the water. In trickling through the crack, "X" is changed by the air into a solid. The heat in the boiler hardens this, making it as tough as metal, capable of withstanding any steam pressure.

Regardless of the quantity used, "X" is absolutely harmless to all metals, leather, rubber, etc. "X" Liquid cannot possibly clog or create unpleasant odors.

Use "X" in New Installations

"X" completes your job when you turn on the water. It tightens every joint and connection, repairs sand holes, poor threads, split nipples, etc.

"X" Does More Than Repair Leaks

Nearly all waters form scale. One-eighth inch of scale necessitates using 25 per cent more coal to get the same amount of heat. If the heating system is treated with "X", all scale and rust will be removed. The surplus "X" remaining in the boiler will prevent rust and scale formation, thereby increasing the life of the boiler, reducing coal bills and automatically repairing any leaks that might occur in the system.

"X" is Unconditionally Guaranteed

If the directions found on every can of "X" are followed and "X" fails to do the work for which it was purchased, return the can to the dealer who will give you a new can or refund your money.

List prices

1 Quart can of "X" Liquid	$5.00
2 Quart can of "X" Liquid	8.00

"Richardson" Bronze

Put up in 1 pound and ½ pound cans.

One pound of Gold Bronze requires 1 quart of liquid and will cover from 250 to 300 square feet of radiation.

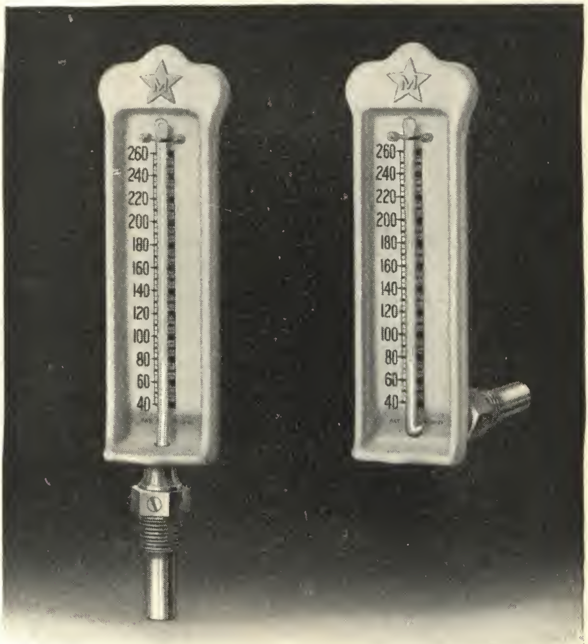
One pound of Aluminum Bronze requires about 1 gallon of liquid and will cover from 500 to 600 square feet of radiation.

List prices

Gold Bronze, 1 pound cans, per pound	$2.00
Gold Bronze, ½ pound cans, per ½ pound	1.75

Aluminum Bronze, 1 pound cans, per pound	$2.50

Enamel and Plain Hot Water Thermometers



Straight Angle

The Hot Water Thermometer will record temperatures accurately and quickly. Care should be taken to be sure that the metal tube surrounding the glass bulb is thoroughly immersed in the hot water. Lower part of the tube is immersed in a mercury bath.

If face does not set in right position when tightened, loosen the screw on the tail-piece, turn face to correct position without lifting, then tighten screw.

Regularly furnished with red spirit liquid, which indicates the temperature more clearly than thermometers made up with mercury columns.

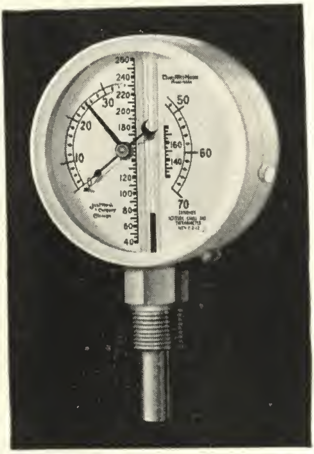
Case is stamped steel, white enameled.

Each thermometer tested before leaving the factory and carefully packed. Threaded for ½-inch tapping.

Straight. Weight packed 1¼ pounds, price each.......	$1.70
Angle. Weight packed 1¼ pounds, price each........	2.00
Plain, straight, price each..........................	1.50
Plain, angle, price each............................	1.75

Ther-Alti-Meter

Combined Altitude Gauge and Hot Water Thermometer



Indicating on the one dial—altitude and temperature.

For Hot Water Boilers—large or small—new or old.

For Standard, Forced and Pressure Hot Water Systems.

For any location in piping or for any tank or apparatus where indication of altitude and temperature is required.

Thermometer Tube—Red spirit—clear, distinct, sensitive, accurate and fitted with mercury bath.

Dial—Especially grooved to receive, cushion and prevent breakage of tube. None-glare pure white dial—altitude in dead black—temperature in bright red.

Case—Dust and moisture-proof—nonbreakable—cold-rolled—stamped steel improved construction.

Ring—Easily detachable and fitted with lock and unlock especially designed thumb screws.

Bourdon Tube—Non-corrosive with interior movement selected and seasoned for hot water work, including higher temperatures of Forced and Pressure Systems.

Connection—Hexagon shank for wrench—all in one piece and with one-half inch male pipe thread.

Permanent white enameled finish—oven baked.

Easily cleansed—retaining the snow white rust-proof finish.

Graduated—0–70 feet altitude and 40 to 260 degrees F.

Supplied in sizes—3½ inch dial, 4½ inch dial.

List prices, $5.50, $6.50.

Gauges

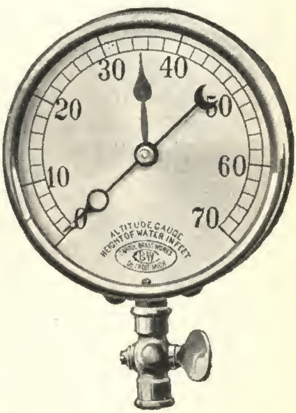
"*Richardson*" Compound Vacuum Pressure Gauge. Indicates vacuum in inches and vapor pressure in ounces.

List price $8.50

Steam Gauges

	List prices
3½-inch low pressure steam gauge	$5.00
4-inch low pressure steam gauge	5.50
5-inch low pressure steam gauge	6.00

Altitude Gauges



Indicate accurately, at the boiler, the height of water in the system.

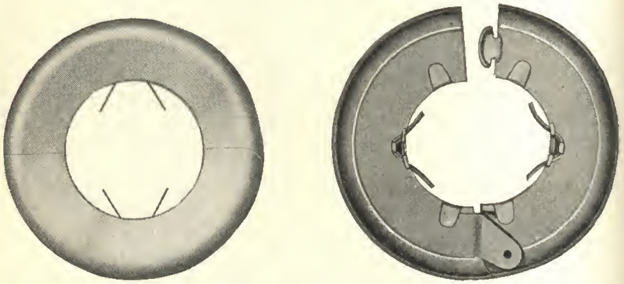
Explanation: When the water is at its proper level in expansion tank remove the ring and glass, and set the stationary red hand at the pressure indicated by the working hand; whenever the pressure falls below this point, water should be added. Sizes 3½ and 5 inches; steel case. Threaded ¼-inch pipe connection.

List Prices

3½-inch Altitude Gauge	$5.00
5-inch Altitude Gauge	7.00

Floor and Ceiling Plates

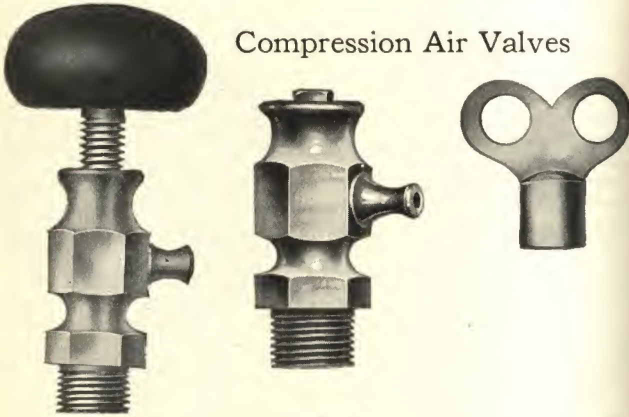
Beaton Pattern



Beaton Plates are made of pressed steel, nickel plated or of black finish, and can be easily put on the pipe after the work is finished by slipping the plate around the pipe, and are held firmly in place by a steel spring.

Size, inches	½	¾	1	1¼	1½
Plain, list price, each	$ .16	.17	.20	.22	.25
Nickel plated, list price, each	.27	.28	.32	.35	.38
Size, inches	2	2½	3	3½	4
Plain, list price, each	$ .30	.50	.65	.80	1.00
Nickel plated, list price, each	.45	.65	.80	1.00	1.25

Compression Air Valves

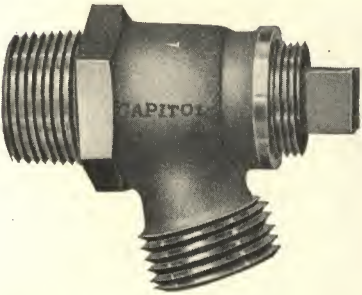


List Prices

Wood wheel, nickel plated, weight packed 1⅓ lbs., doz. $4.00
Key, nickel plated, weight packed 1¼ lbs., doz. 3.00

Two keys regularly furnished with each dozen. Extra keys, 5 cents each, net.

Boiler Draw Off Cock



Especially designed for a boiler drain valve. Made of brass throughout—brass seat. Boiler connection ¾-inch iron pipe size. Outlet, ¾-inch standard hose thread. Brass finish.

List price $1.75

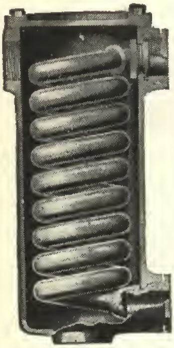
Consolidated Pop Safety Valves

Low Pressure, Bronze Finish

These valves are especially designed for house heating boilers. Regularly set to relieve at 10 or 15 pounds. Non-adjustable. A. S. M. E. standard.

Size, inches	1	1¼	1½	2	2½	3	3½
List price	$6.00	$6.75	$8.25	$11.25	$26.00	$37.50	$50.00

Excelso Hot Water Heaters



Excelso Heater meets all requirements. The Excelso method of generating domestic hot water is far superior to fire pot pipe coils because it insures at all times during the heating season an absolute constant flow of hot water, at an even temperature, regardless of the intensity of the fire. The Excelso Heater connects on the outside of any steam or vapor heating boiler, below the water line and uses the boiling water in the heating boiler as the source of heat for domestic supply of water.

Dimensions—Price list—Capacities

Size of heater	Jr.	11	12	13	14
Length, inches	8½	10½	14	11½	15
Diameter, inches	5	5	5	6½	6½
Shell openings, inches	1	1	1	1½	1½
Coil openings, inches	¾	¾	¾	1	1
Weight, crated, pounds	11	17	23	31	39
List price	$12.50	30.00	40.00	50.00	60.00
Size of heater	15	25	*26	*27	*28
Length, inches	19½	12½	15	19	23¼
Diameter, inches	6½	9	9	9	9
Shell openings, inches	1½	2	2	2	2
Coil openings, inches	1	1½	1½	1½	1½
Weight, crated, pounds	46	58	68	82	95
List price	$70.00	120.00	150.00	180.00	210.00

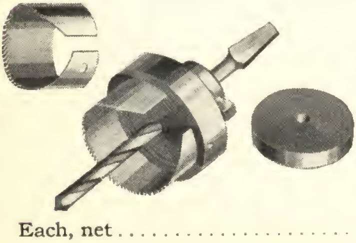
* Formerly Nos. 16, 17 and 18.

Heating Water Below Water Line of Steam or Vapor Boilers

Size of heater	Jr.	11	12	13	14	15	25	26	27	20
Tank cap	30	30	45	60	90	120	160	200	300	400

Capacity figured at temperature rise 100 degrees in 3 hours. When Excelso Heaters are used allow extra load on boiler 1½ square feet of radiation for each gallon of water heated per hour.

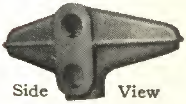
Excelso Rotary Hack Saw



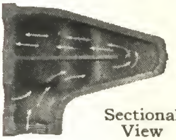
Makes a clean circular cut in iron or other metals. Applicable to all kinds of work when tappings are required. Operated in an ordinary brace. it will cut through ¼ inch of iron in a few minutes. Shipped complete with two sets of blades for each size, 1 inch, 1¼ inch, 1½ inch.

Each, net $7.50

Excelso Firepot Generators



Side View



Sectional View

The Excelso Fire Pot Generator is so constructed that it is located entirely above the fire.

The design of the Excelso Fire Pot Generator is unique. The five finger construction divides the water and the baffle plate forces all the water to the outer ends of each finger.

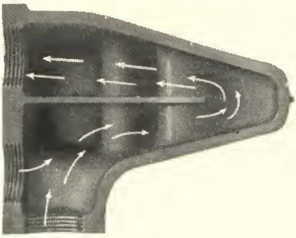
This design allows the heater to be located entirely above the fire, hence it cannot "deaden" the coal or allow cold air to short circuit up through the fuel bed.

Heating engineers and boiler designers recognize these harmful effects and consequent boiler inefficiency caused by coils and generators located in the fuel bed.

The Excelso Fire Pot Generator has three openings for piping connections, two of which are used, the third plugged. Any combination of piping for any type of boiler or furnace may be made by means of these openings

A

B



C

Boilers usually have cored openings in the back of the fire pot section of varying distances center to center. Openings A and C are used for this class of boilers using a nipple and elbow to make the correct center to center and opening B is plugged.

Hot air furnaces usually have openings cored in the fire door frame 2½ inches center to center. Openings A and B are used being 2½ inches center to center and opening C is plugged.

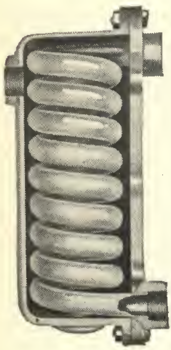
When Excelso Fire Pot Generators are used in fire pots of Hot Water Boilers, allow extra load on boiler 2½ square feet of radiation for each gallon of water heated per hour.

The Excelso Fire Pot Generator is made in two sizes in both cast iron or brass.

Size No. 1	Up to 40 gallons capacity, list price......	$ 8.00
Size No. 2	Over 40 to 60 gallons capacity, list price..	12.00

Prices of brass heaters will be furnished on application.

Domestic Taco Water Heaters



Making your heating boiler heat your domestic water too.

Attaching Domestic Taco Water Heater to your heating boiler is like adding an extra section to a radiator; the added load on your boiler is so slight that no difference in your coal bill can be noticed.

Yet Taco gives you an abundance of hot water day and night; never too hot; never cool—but a constant, even temperature of piping hot water all the time.

Dimensions—Price list—Capacities

No.	Capacity Gals.	Tank Connections In.	Boiler Connections In.	Shipping Weight Lbs.	List Price
30	30	¾	1	11	$15.00
1	40	¾	1	14	20.00
2	80	1	1¼	24	30.00
3	160	1¼	2	52	50.00

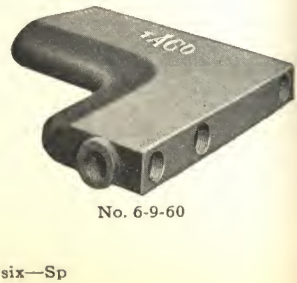
When Taco Heaters are used allow extra load on boiler 1½ square feet of radiation for each gallon of water heated per hour.

Universal Taco Water Heaters

Nos. **6-9-30** and **6-9-60**

For boilers with coil openings measuring 6, 9 or more inches center to center

No. 6-9-30



No. 6-9-60

Universal Taco Water Heaters (*Continued*)

These heaters are made without studs and are tapped for 1-inch pipe connections on 6 and 9-inch centers. An extra tapping on bottom accommodates distances greater than 9 inches, or may be used as a clean-out. The unused tappings are to be plugged. Can be used in hot air furnaces usually inverted.

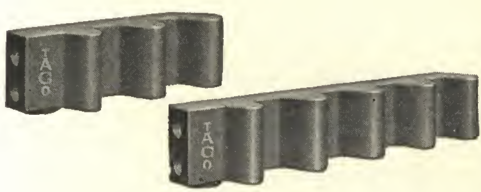
List prices

No. 6-9-30 For use with 30-gallon tanks. Malleable Iron . . . . $ 8.00
Brass 20.00
(Shipping weight—10 pounds)

No. 6-9-60 For use with 60-gallon tanks. Malleable Iron $14.00
Brass 35.00
(Shipping weight—17 pounds)

Nos. 3-30 and 3-60

For sectional boilers having 3 or 5-inch center to center cored openings, and also for use with hot air furnaces



List prices

No. 3-30 For use with 30-gallon tanks. Malleable Iron . . . . $ 8.00
(Shipping weight—10 pounds)

No. 3-60 For use with 60-gallon tanks. Malleable Iron $14.00
(Shipping weight—17 pounds)

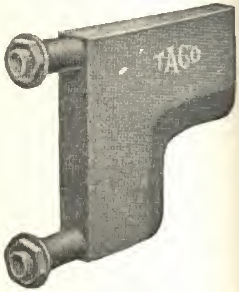
Universal Taco Water Heaters (*Continued*)

Nos. 9-30 and 9-60

Patented December 20, 1921

For boilers having 9-inch center-to-center coil openings

No. 9-30



No. 9-60

These heaters are made with studs which pass through the boiler wall. Easily fixed to the boiler.

When Universal Taco Water Heaters are used in fire pots of Hot Water Boilers, allow extra load on boiler 2½ square feet of radiation for each gallon of water heated per hour.

List prices

No. 9-30 For use with 30-gallon tanks. Malleable Iron . . . . $ 8.00

(Shipping weight—10 pounds)

No. 9-60 For use with 60-gallon tanks. Malleable Iron $14.00

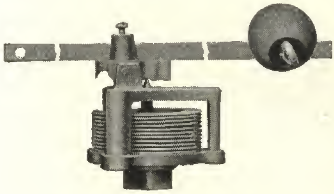
(Shipping weight—17 pounds)

All types of Universal Taco Water Heaters are made of malleable iron. These are tested to 250 pounds pressure. The 6-9-30, 6-9-60 made in brass also.

Universal Taco Water Heaters are set flush against the fire-pot wall and leave no air space to cause the fire to burn out around the heater. They have no fins or projections to catch ashes and to clinker up. They do not interfere with efficient firing.

Home-made coils have always been troublesome because of either over-heating when fire is pushed, or under-heating when fire is low. Universal Heaters improve this condition. Slightly varying fire depth either above or below curved portion, considerably varies amount of water heated. By carrying fire above the curved portion in mild weather over 50 per cent. more of its surface is in the fire than with fire carried two inches lower, and so increases the amount of water heated.

Sylphon Damper Regulator for Low Pressure Steam Boilers



This regulator has demonstrated its superior merit by extensive use during the past sixteen years throughout the United States and many foreign countries.

It is suitable for regulating steam pressure, by means of damper control, within the limits ordinarily required on house heating systems, and for this purpose has no equal. Composed entirely of metal, no perishable parts, and will not deteriorate with age.

The rocker which carries the lever bar has a brass pivot, and the plunger is provided with a knife edge bearing, which insures against rust and corrosion that are so often the cause of friction and consequent loss of power where iron pivots are used.

The lever bar is readily adjusted longitudinally by loosening the set screw in the top of the rocking member. When longitudinal adjustment is undesirable, the lever bar can be made fast by inserting a pin, or bolt (not shown in illustration) through the rocker and bar.

With standard weight and lever, regulator will operate on pressures from 12 ounces up to 5 pounds gauge.

With additional weight higher pressure can be obtained. Under no circumstances should this regulator be subjected to more than 25 pounds pressure.

In order to secure sensitive operation, dampers must be balanced and friction eliminated.

Data and Dimensions

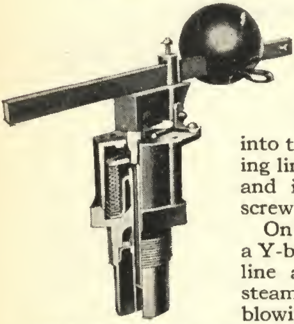
Tapped at bottom connection for 1-inch standard iron pipe. Bellows, 4⅝ inches O. D., lever bar, 36 inches long (other lengths furnished on special order). Adjusting weights, 3 pounds each. Shipping weight, boxed, 20 pounds.

Shipped complete with 12 feet of chain, 4 S-hooks, one 1-inch close nipple, two ceiling pulleys, lever bar and two adjusting weights.

List price $20.00

Nos. 45A and 45B Sylphon Water Temperature Regulator for House-Heating Water Boilers and Tank Heaters

Direct Connection, Adjustable Rocker Type



These regulators are especially recommended for automatically controlling the dampers of house heating water boilers and tank heaters where conditions permit the bulb of the regulator being screwed directly into the boiler or pipe fitting in the circulating line. The bulb is only 2 inches in length and is therefore specially adapted to be screwed into boilers having thin water space.

On tank heaters they can be screwed into a Y-branch or other fitting in the circulating line and thus prevent the generation of steam with the consequent disagreeable blowing off when the faucet is opened, and the rotting out of pipes and storage tanks. Insure faucet water of even temperature and eliminate the danger of scalded hands. Prevent fire going out under check.

The rocker has knife-edge pivots and is frictionless. Plunger is guided at bottom end inside regulator, as well as top, thereby insuring true vertical movement—a very desirable feature possessed by no other regulator. Nothing to wear out and no expense for up-keep.

Operates through the movement of the Sylphon bellows inside the housing of regulator produced by volatile liquid in the bulb. Lever bar is adjustable longitudinally.

The rocker has three adjustments whereby the distance between the rear pivot and the plunger pivot can be readily increased or diminished before or after regulator is installed. By increasing this distance greater power is obtained for operating dampers that are not well balanced. Decreasing this distance gives less power, but greater sensitiveness and delicacy of operation.

Data and Dimensions

With standard weight and lever, regulators will control water temperatures as follows:

No. 45A .... 120 to 220 degrees F.
No. 45B .... 100 to 200 degrees F.

Hub of regulator is threaded 2-inch standard pipe size, length of bulb 2 inches. Lever bar 48 inches long.

Adjusting weights (two) $4\frac{1}{2}$ pounds each. Shipping weight, complete with trimmings, 20 pounds boxed.

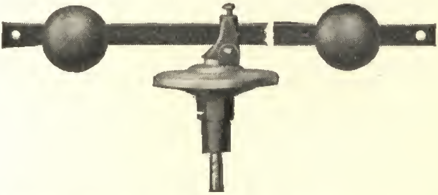
Shipped complete with 8 feet of chain; 8 feet wire cable; 4 S-hooks; 2 ceiling pulleys, 1 lever bar and 2 adjusting weights.

Illustrated instruction sheet accompanies each regulator.

List price $20.00

Deegan Automatic Regulator

For Water Boilers and Tank Heaters



Make Your Heater Self-Regulating

Think of the pleasure, the satisfaction and the convenience of having your hot water heater so equipped that it responds automatically to any change in the weather either by checking the fire or opening the draft exactly as needed to maintain a uniform temperature. Moreover, when your heater does this hour after hour, day and night, without supervision or attention, then you realize how much time, labor and thought you and the family wasted in regulating the heater before this practical little device made it unnecessary to do more than put on a little coal a couple of times a day.

By placing the weights at certain points on the regulating lever the water in the heater is automatically maintained at a uniform temperature, irrespective of weather conditions. In mild weather you can have a uniformly mild heat, just enough to take the chill off, and in severe weather you can have a uniform volume of heat which keeps the house equally comfortable at all times, day and night.

The regulator arm opens the draft and at the same time closes the damper (or reverses the operation) automatically whenever necessary to maintain uniform temperature of water.

Without automatic regulation a great deal of heat is wasted. Hot water cools so slowly that in order to lower the temperature of a too warm room, windows or doors are thrown open. It is equally true that water heats slowly and oftentimes in the morning the fire must be rushed for some time before the house becomes comfortable. By keeping the water always at the same temperature, H. W. Automatic Regulators keep the fire uniform and thus burn fuel most efficiently. Thousands of successful installations have demonstrated again and again the fact that H. W. Automatic Regulators save 25 per cent or more of the fuel formerly required for the same heater.

RICHARDSON

Information and Rules Pertaining to Steam and Hot Water Heating

THE information and rules shown in the following pages are for the use of architects and practical steam fitters, but its accuracy in general practice can in no way be guaranteed by us. ¶ All the data given has been compiled with great care from standard authorities, and will prove of great service if used in connection with practical experience

Telegraph Code

All code words should begin with capital letters

Quotations and Correspondence

Quote best price and when can you ship?	Aback
Wire quotation on	Abscess
Write quotation on	Abeam
Telegraph answer	Aborn
Will write full particulars	Abdom
Answer by mail	About
Refer to our letter of	Access
Wire carload rate of freight to	Adhere
Send Boiler Catalog at once	Affect
Send Boiler Price List at once	Affix
Wire reply	Akin

Orders and Shipments

Ship at once	Babel
Ship all rail at once	Black
Ship via steamer at once	Baffle
Ship by express	Bailiff
Ship via best route	Bane
Ship with draft attached to bill of lading	Beam
Shipping instructions will follow by mail	Bicker
Ship what you can at once	Biped
Trace shipment of	Blade
When can you ship?	Bleak
When will you ship our order?	Bodice
Add to our order	Boggle
Hold for instructions our order	Bolster
Refer to our order	Bother

Telegraph Code (Continued)

Days and Months

In telegraphing dates, prefix the day of the month; for example, "Allenfield" would mean second day of March.

Date	Code Word
1	Archer
2	Allen
3	Agnes
4	Andrew
5	Bert
6	Brother
7	Brooks
8	Charles
9	Chaucer
10	Cameron
11	Casper
12	David
13	Dorothy
14	Donald
15	Edith
16	Emmet
17	Ethel
18	Frank
19	Frederick
20	George
21	Hamil
22	Herrick
23	Jackson
24	James
25	Johnson
26	Lewis
27	Landis
28	Martin
29	Norris
30	Philip
31	Peter

Month	Code Word
January	Boro
February	Dale
March	Field
April	Ford
May	Ham
June	Mere
July	Mote
August	Town
September	Ton
October	Ville
November	Wood
December	Ward

Time	Code Word
1 Day	Craig
2 Days	Cachet
3 Days	Croup
4 Days	Caliber
5 Days	Celery
6 Days	Centaur
10 Days	Challis
1 Week	Charm
2 Weeks	Chasm
3 Weeks	Cheer
1 Month	Chisel
2 Months	Chock
3 Months	Chuck
4 Months	Citron
5 Months	Clamor
6 Months	Crochet

IMPORTANT

Rules for Determining Amount of Direct Radiation Required in House Heating

In figuring the radiation required for any given room, it is desirable, if accurate results are expected, to take into consideration the glass and wall exposures, as well as the cubical contents; and the following rule, which is easily understood and simple to work out, is recommended as one which has given general satisfaction.

Rule No. 1

First, find the total square feet of glass surface in windows and outside doors, taking the full opening measurements and counting outside doors as all glass (see Page 11)—then measure the surface in exposed outside wall (see Page 12) from which subtract the glass surface—reduce the wall surface to equivalent glass surface by dividing the net amount by—

10 if wall is 8 to 10 inches thick
15 if wall is 12 to 26 inches thick
20 if wall is 26 to 38 inches thick

To this result add the glass exposure, which gives the glass equivalent of wall and glass exposure; then, as one square foot of glass surface cools 75 cubic feet of air per hour, multiply the total glass equivalent by 75 (see Page 13), which gives the total cubic feet of air to be heated to offset the loss from glass and wall exposure. This total added to the cubical contents (see Pages 14 to 19) gives the amount of air to be heated. For a temperature of 70 degrees Fahrenheit, in zero weather, multiply the amount of air to be heated by the following:—

.0055 for steam heating
.0092 for water heating

and the result will be the number of square feet of radiation required. For each degree below zero, add 1 per cent to radiation as figured above.

Example: What amount of water radiation will be required for a room 12 x 18 x 9 with 4 windows, 3 feet by 5½ feet each, with 2 outside walls 10 inches thick—heating required for 10 degrees below zero.

Square feet of glass surface..........	$3 \times 5\frac{1}{2} \times 4 =$	66
Square feet of outside wall surface...	$12 + 18 \times 9 =$	270
Net exposed wall surface............	$270 - 66 =$	204
Equivalent glass surface in wall exposure.....................	$204 \div 10 =$	20
Amount of air cooled by glass and wall surface..................	$20 + 66 \times 75 =$	6450
Cubical contents of room...........	$12 \times 18 \times 9 =$	1944
Total cubic feet of air to be heated...	$6450 + 1944 =$	8394
Water radiation required for zero....	$8394 \times .0092 =$	77 sq. ft.
Water radiation required 10 degrees below zero..................	$77 + 8 =$	85 sq. ft.

This radiation is based on the average temperature of the water being 160 degrees; but the following Multipliers can be used, which will give the required radiation with the water at various temperatures.

Average temperature of water in radiators...	Deg. 140	Deg. 150	Deg. 160	Deg. 170	Deg. 180	Deg. 190	Deg. 200	Deg. 210
Multiplier............	.0123	.0106	.0092	.0081	.0072	.0064	.0058	.0053

This rule gives the total amount of radiation required for the building; and judgment must be used in increasing the radiation in the rooms on the cold side, exposed to the north and west, and reducing the radiation on the warm side; also making allowance for poorly constructed buildings, loose fitting windows, etc.

Under general conditions this rule will give satisfactory results —it allows for only one change of air per hour. If special ventilation is required, increase the cubical contents as many times as it is necessary to change the air; but the application of the rule remains the same.

If direct—indirect radiation is to be used, increase the amount of direct radiation 25 per cent.

If indirect radiation is to be used, increase the amount of direct radiation 50 per cent.

Richardson Rule No. 2

For those who desire to base their calculations on the most recent information as to the heat losses from buildings, we give the following tables, together with Prof. Carpenter's Rule which is based thereon.

The Heat loss in B. t. u. per Hour per Square Foot of Surface per Degree Difference in Temperature for the ordinary types of building construction is given below.

Brick Walls

Thickness Inches	Plain	Plastered One Side	Furred and Plastered	Air Space and Plastered
4	0.52	0.50	0.28	....
8½	0.37	0.36	0.23	0.25
13	0.29	0.28	0.20	0.21
17½	0.25	0.24	0.18	0.19
22	0.22	0.21	0.16	0.16
26½	0.19	0.18	0.15	0.14

If walls are of concrete, add 20 per cent. to the above values.

For the walls of frame buildings of the indicated outside construction, and lath and plaster inside:—

Clapboards, 7/16 inch thick	0.44
Same with paper lining	0.31
Same with ¾ inch sheathing	0.28
Same with paper and ¾ inch sheathing	0.23

For the following indicated types of walls:—

Thickness of Board Inches	Pine Board	Double Board Paper Between	Board and Sheet Iron	Board and Corrugated Iron
½	0.77	0.32	0.50	0.45
1	0.51	0.24	0.40	0.36
1½	0.43	0.19	0.33	0.30
2	0.35	0.16	0.28	0.26
2½	0.30	0.14	0.25	0.23

For the following indicated types of floor surfaces:—

Single wooden floor, no plaster under joists	0.45
Same, lath and plaster under joists	0.26
Double wooden floor, no plaster under joists	0.31
Same, lath and plaster under joists	0.18

Concrete floors—same as concrete walls.

For the following indicated types of floors laid directly on the ground:—

Cement or tile, no wood floor above	0.31
Same, wood floor above	0.10
Dirt floor	0.20
Single wood floor, laid near ground	0.10

For the following indicated types of roof construction:—

Sheet iron	1.20
Corrugated iron	1.50
Slate on wood frame	0.85
Slate on 1-inch boards	0.43
Paper, tar and gravel on 2-inch boards	0.26
Patent tar, gravel and paper	0.30
Tiling 1-inch thick and less	0.80
2-inch concrete, tar and gravel on 6-inch hollow tile	0.35
2-inch concrete, and cinderfill	0.80
4-inch concrete, and cinderfill	0.60
6-inch concrete, and cinderfill	0.54

For the following indicated types of glass surface and doors:—

Single windows	1.09
Double windows	0.46
Single skylight	1.16
Double skylight	0.48
Pine doors 1 inch	0.41
Pine doors 1½ inches	0.32
Pine doors 2 inches	0.27

The above figures when multiplied by the area of a surface and the difference in temperature between the air inside and the air outside the surface will give the total heat loss from the surface per hour. The temperature of an unheated space beneath a floor or above a ceiling should be taken as a mean between the indoor and outdoor temperature, and where floors are laid on the ground, the temperature of the ground should be assumed at 30 degrees to 50 degrees F.

Besides the above heat losses, the air entering the building from outside by infiltration or through the opening of the doors and windows has to be heated from the outdoor temperature to the room temperature. One B. t. u. will heat 55 cubic feet of air at 70 degrees through 1 degree F. Therefore, if the cubic contents of the building be represented by C, the number of changes of air per hour by n, the indoor temperature by t_r, and the outdoor temperature by t_o, the heat required to offset these leakage losses will be as follows:—

$$H = \frac{(t_r - t_o)nC}{55}$$

Prof. Carpenter deduces from all the above data that the constant for single glass may be taken as 1, and the constant for walls in general may be taken as .25. This makes the total heat loss per hour in B. t. u.,

$$H = (t_r - t_o) \left(G + \tfrac{1}{4}W + \frac{nC}{55} \right)$$

which is known as Carpenter's rule.

The above rule applies to all kinds of buildings except greenhouses, where the glass area is very large compared to the wall area and cubic contents, and there is very little circulation of air. In greenhouse work we therefore neglect the $\frac{nC}{55}$ term, making the formula for the heat loss

$$H = (t_r - t_o) \quad (G + \tfrac{1}{4}W)$$

and to determine the amount of radiation required, multiply the heat loss by the co-efficient for pipe coils as given in the table below.

To find the number of square feet of radiation required to heat any room, find the heat loss by Carpenter's rule, given above, and multiply the heat loss by the proper co-efficient taken from the following table:

	Direct Cast Iron	Direct Indirect Cast Iron	Indirect Cast Iron	Wall Cast Iron	Direct Pipe Coils
Steam....	.004	.005	.006	.0036	.0033
Water....	.006	.0075	.009	.0054	.005

Green Houses and Conservatories

Amount of Hot Water Radiating Surface

Necessary to heat given amount of glass exposure when outside temperature is at Zero Fahrenheit

Sq. Feet Glass Exposure	Number Sq. Feet Radiation required at				
	40°	45°	50°	60°	70°
25	$4\frac{1}{6}$	5	$6\frac{1}{4}$	$7\frac{1}{7}$	$8\frac{1}{3}$
50	8	10	13	14	16
75	13	15	19	21	25
100	17	20	25	29	33
200	33	40	50	57	67
300	50	60	75	86	100
400	67	80	100	114	133
500	83	100	125	143	167
1000	167	200	250	286	333
2000	333	400	500	572	667
3000	500	600	750	857	1000
4000	667	800	1000	1143	1333
5000	833	1000	1250	1429	1667
10000	1667	2000	2500	2857	3333
20000	3333	4000	5000	5714	6667
30000	5000	6000	7500	8572	10000
40000	6667	8000	10000	11429	13333
50000	8333	10000	12500	14286	16666

Amount of Steam Radiating Surface

Necessary to heat given amount of glass exposure when outside temperature is at Zero Fahrenheit

Sq. Feet Glass Exposure	Number Sq. Feet Radiation required at				
	40°	45°	50°	60°	70°
25	$2\frac{2}{9}$	$3\frac{1}{8}$	$3\frac{4}{7}$	$4\frac{1}{6}$	5
50	$5\frac{5}{9}$	$6\frac{1}{4}$	$7\frac{1}{7}$	$8\frac{1}{3}$	10
75	8	9	10	13	15
100	11	13	14	17	20
200	23	25	30	33	40
300	34	38	43	50	60
400	45	50	57	67	80
500	56	63	72	83	100
1000	112	125	143	167	200
2000	223	250	286	333	400
3000	334	375	429	500	600
4000	445	500	571	667	800
5000	556	625	714	833	1000
10000	1112	1250	1429	1667	2000
20000	2223	2500	2857	3333	4000
30000	3334	3750	4286	5000	6000
40000	4445	5000	5714	6667	8000
50000	5556	6250	7143	8333	10000

Square Feet of Exposed Glass Surface in Windows of Various Sizes

Width of Window Feet	Height of Window in Feet												
	2	2½	3	3½	4	4½	5	5½	6	6½	7	7½	8
1½	3	4	4½	5½	6	7	7½	8½	9	10	10½	11½	12
2	4	5	6	7	8	9	10	11	12	13	14	15	16
2½	5	6½	7½	9	10	11½	12½	14	15	16½	17½	19	20
3	6	7½	9	10½	12	13½	15	16½	18	19½	21	22½	24
3½	7	9	10½	12½	14	16	17½	19½	21	23	24½	26½	28
4	8	10	12	14	16	18	20	22	24	26	28	30	32
4½	9	11½	13½	16	18	20½	22½	25	27	29½	31½	34	36
5	10	12½	15	17½	20	22½	25	27½	30	32½	35	37½	40
5½	11	14	16½	19½	22	25	27½	30½	33	36	38½	41½	44
6	12	15	18	21	24	27	30	33	36	39	42	45	48
6½	13	16½	19½	23	26	29½	32½	36	39	42½	45½	49	52
7	14	17½	21	24½	28	31½	35	38½	42	45½	49	52½	56
7½	15	19	22½	26½	30	34	37½	41½	45	49	52½	56½	60
8	16	20	24	28	32	36	40	44	48	52	56	60	64

Square Feet of Exposed Wall Surface in Rooms of Various Sizes

Height of Ceiling, Feet	Length in Feet of Side Exposed														
	4	4½	5	5½	6	6½	7	7½	8	8½	9	9½	10	10½	11
8	32	36	40	44	48	52	56	60	64	68	72	76	80	84	88
8½	34	38	42	47	51	55	59	64	68	72	76	81	85	89	93
9	36	40	45	49	54	58	63	67	72	76	81	85	90	94	99
9½	38	43	47	52	57	62	66	71	76	81	85	90	95	100	104
10	40	45	50	55	60	65	70	75	80	85	90	95	100	105	110
10½	42	47	52	58	63	68	73	79	84	89	94	100	105	110	115
11	44	49	55	60	66	71	77	82	88	93	99	104	110	115	121
12	48	54	60	66	72	78	84	90	96	102	108	114	120	126	132

Height of Ceiling, Feet	11½	12	12½	13	13½	14	14½	15	15½	16	16½	17	17½	18	18½
8	92	96	100	104	108	112	116	120	124	128	132	136	140	144	148
8½	98	102	106	110	114	119	123	127	132	136	140	144	148	153	157
9	103	108	112	117	121	126	130	135	139	144	148	153	157	162	166
9½	109	114	119	123	128	133	138	142	147	152	157	161	166	171	176
10	115	120	125	130	135	140	145	150	155	160	165	170	175	180	185
10½	121	126	131	136	142	147	152	157	163	168	173	178	184	189	194
11	126	132	137	143	148	154	159	165	170	176	181	187	192	198	203
12	138	144	150	156	162	168	174	180	186	102	198	204	210	216	222

In above totals fraction are omitted.

Air in Cubic Feet Cooled by Glass and Equivalent Glass

One Degree Per Hour

To be used in connection with Rule No. 1, Page 4

Glass	Air	Glass	Air	Glass	Air	Glass	Air	Glass	Air
10	750	52	3900	94	7050	136	10200	178	13350
11	825	53	3975	95	7125	137	10275	179	13425
12	900	54	4050	96	7200	138	10350	180	13500
13	975	55	4125	97	7275	139	10425	181	13575
14	1050	56	4200	98	7350	140	10500	182	13650
15	1125	57	4275	99	7425	141	10575	183	13725
16	1200	58	4350	100	7500	142	10650	184	13800
17	1275	59	4425	101	7575	143	10725	185	13875
18	1350	60	4500	102	7650	144	10800	186	13950
19	1425	61	4575	103	7725	145	10875	187	14025
20	1500	62	4650	104	7800	146	10950	188	14100
21	1575	63	4725	105	7875	147	11025	189	14175
22	1650	64	4800	106	7950	148	11100	190	14250
23	1725	65	4875	107	8025	149	11175	191	14325
24	1800	66	4950	108	8100	150	11250	192	14400
25	1875	67	5025	109	8175	151	11325	193	14475
26	1950	68	5100	110	8250	152	11400	194	14550
27	2025	69	5175	111	8325	153	11475	195	14625
28	2100	70	5250	112	8400	154	11550	196	14700
29	2175	71	5325	113	8475	155	11625	197	14775
30	2250	72	5400	114	8550	156	11700	198	14850
31	2325	73	5475	115	8625	157	11775	199	14925
32	2400	74	5550	116	8700	158	11850	200	15000
33	2475	75	5625	117	8775	159	11925	201	15075
34	2550	76	5700	118	8850	160	12000	202	15150
35	2625	77	5775	119	8925	161	12075	203	15225
36	2700	78	5850	120	9000	162	12150	204	15300
37	2775	79	5925	121	9075	163	12225	205	15375
38	2850	80	6000	122	9150	164	12300	206	15450
39	2925	81	6075	123	9225	165	12375	207	15525
40	3000	82	6150	124	9300	166	12450	208	15600
41	3075	83	6225	125	9375	167	12525	209	15675
42	3150	84	6300	126	9450	168	12600	210	15750
43	3225	85	6375	127	9525	169	12675	211	15825
44	3300	86	6450	128	9600	170	12750	212	15900
45	3375	87	6525	129	9675	171	12825	213	15975
46	3450	88	6600	130	9750	172	12900	214	16050
47	3525	89	6675	131	9825	173	12975	215	16125
48	3600	90	6750	132	9900	174	13050	216	16200
49	3675	91	6825	133	9975	175	13125	217	16275
50	3750	92	6900	134	10050	176	13200	218	16350
51	3825	93	6975	135	10125	177	13275	219	16425

Table of Cubical Contents. Ceiling Heights

Room Size	8 ft.	8½ ft.	9 ft.	9½ ft.	10 ft.	10½ ft.	11 ft.	12 ft.
3 x3	72	77	81	85	90	95	99	108
3 x3½	84	89	95	99	105	110	115	126
3 x4	96	102	108	114	120	126	132	144
3 x4½	108	115	122	128	135	142	148	162
3 x5	120	128	135	142	150	158	165	180
3 x5½	132	140	149	156	165	173	181	198
3 x6	144	153	162	171	180	189	198	216
3½x3½	98	104	110	116	123	129	134	147
3½x4	112	119	126	133	140	147	154	168
3½x4½	126	134	142	149	158	165	173	189
3½x5	140	149	158	166	175	184	192	210
3½x5½	154	164	173	182	193	202	211	231
3½x6	168	179	189	199	210	221	231	252
3½x6½	182	193	205	216	228	239	250	273
3½x7	196	208	221	232	245	257	269	294
4 x4	128	136	144	152	160	168	176	192
4 x4½	144	153	162	171	180	189	198	216
4 x5	160	170	180	190	200	210	220	240
4 x5½	176	187	198	209	220	231	242	264
4 x6	192	204	216	228	240	252	264	288
4 x6½	208	221	234	247	260	273	286	312
4 x7	224	238	252	266	280	294	308	336
4 x7½	240	255	270	285	300	315	330	360
4 x8	256	272	288	304	320	336	352	384
4½x4½	162	172	182	192	203	213	222	243
4½x5	180	191	203	213	225	236	247	270
4½x5½	198	210	223	235	248	260	272	297
4½x6	216	230	243	256	270	284	297	324
4½x6½	234	249	263	277	293	307	321	351
4½x7	252	268	284	299	315	331	346	378
4½x7½	270	287	304	320	338	354	371	405
4½x8	288	306	324	342	360	378	396	432
4½x8½	306	325	344	363	383	402	420	459
4½x9	324	345	365	384	405	425	445	486
5 x5	200	212	225	237	250	263	275	300
5 x5½	220	234	248	261	275	289	302	330
5 x6	240	255	270	285	300	315	330	360
5 x6½	260	276	293	308	325	341	357	390
5 x7	280	297	315	332	350	368	385	420
5 x7½	300	319	338	358	375	394	412	450
5 x8	320	340	360	380	400	420	440	480
5 x8½	340	361	383	403	425	446	467	510
5 x9	360	382	405	427	450	473	495	540
5 x9½	380	404	428	451	475	499	522	570
5 x10	400	425	450	475	500	525	550	600
5½x5½	242	257	272	287	303	318	332	363
5½x6	264	281	297	313	330	347	363	396
5½x6½	286	304	322	339	358	375	393	429
5½x7	308	327	347	365	385	404	423	462
5½x7½	330	351	371	391	413	433	453	495
5½x8	352	374	396	418	440	462	484	528
5½x8½	374	397	421	444	468	491	514	561
5½x9	396	421	446	470	495	520	544	594
5½x9½	418	444	470	496	523	549	574	627

Table of Cubical Contents (Continued)

Ceiling Heights

Room Size	8 ft.	8½ ft.	9 ft.	9½ ft.	10 ft.	10½ ft.	11 ft.	2 ft.
5½x10	440	468	495	522	550	578	605	660
5½x10½	462	491	520	548	578	606	635	693
5½x11	484	514	545	574	605	635	665	726
6 x 6	288	306	324	342	360	378	396	432
6 x 6½	312	332	351	370	390	410	429	468
6 x 7	336	357	378	399	420	441	462	504
6 x 7½	360	383	405	427	450	473	495	540
6 x 8	384	408	432	456	480	504	528	576
6 x 8½	408	434	459	484	510	536	561	612
6 x 9	432	459	486	513	540	567	594	648
6 x 9½	456	485	513	541	570	599	627	684
6 x10	480	510	540	570	600	630	660	720
6 x10½	504	536	567	598	630	662	693	756
6 x11	528	561	594	627	660	693	726	792
6 x11½	552	587	621	655	690	725	759	828
6 x12	576	612	648	684	720	756	792	864
6½x 6½	338	359	380	401	423	444	464	507
6½x 7	364	387	410	432	455	478	500	546
6½x 7½	390	414	439	463	488	512	536	585
6½x 8	416	442	468	494	520	546	572	624
6½x 8½	442	470	497	524	553	580	607	663
6½x 9	468	497	527	555	585	615	643	702
6½x 9½	494	525	556	586	618	648	679	741
6½x10	520	553	585	617	650	683	715	780
6½x10½	546	580	614	648	683	717	750	819
6½x11	572	608	644	679	715	751	786	858
6½x11½	598	635	673	710	748	785	822	897
6½x12	624	663	702	741	780	819	858	936
6½x12½	650	691	731	771	813	853	893	975
6½x13	676	718	761	802	845	887	929	1014
7 x 7	392	417	441	465	490	515	539	588
7 x 7½	420	446	473	498	525	551	577	630
7 x 8	448	476	504	532	560	588	616	672
7 x 8½	476	506	536	565	595	625	654	714
7 x 9	504	536	567	598	630	662	693	756
7 x 9½	532	565	599	631	665	698	731	798
7 x10	560	595	630	665	700	735	770	840
7 x10½	588	625	662	698	735	772	808	882
7 x11	616	655	693	731	770	809	847	924
7 x11½	644	684	725	764	805	845	885	966
7 x12	672	714	756	798	840	882	924	1008
7 x12½	700	744	788	831	875	919	962	1050
7 x13	728	774	819	864	910	956	1001	1092
7 x13½	756	803	851	897	945	992	1039	1134
7 x14	784	833	882	931	980	1029	1078	1176
7½x 7½	450	478	506	534	563	591	618	675
7½x 8	480	510	540	570	600	630	660	720
7½x 8½	510	542	574	605	638	669	701	765
7½x 9	540	574	608	641	675	709	742	810
7½x 9½	570	606	641	676	713	748	783	855
7½x10	600	638	675	712	750	788	825	900
7½x10½	630	669	709	748	788	827	866	945
7½x11	660	701	743	783	825	866	907	990
7½x11½	690	733	776	819	863	906	948	1035

Table of Cubical Contents (Continued)

Ceiling Heights

Room Size	8 ft.	8½ ft.	9 ft.	9½ ft.	10 ft.	10½ ft.	11 ft.	12 ft.
7½x12	720	765	810	855	900	945	990	1080
7½x12½	750	797	844	890	938	984	1031	1125
7½x13	780	829	878	926	975	1024	1072	1170
7½x13½	810	861	911	961	1013	1063	1113	1215
7½x14	840	893	945	997	1050	1103	1155	1260
7½x14½	870	924	979	1033	1088	1142	1196	1305
7½x15	900	956	1013	1068	1125	1181	1237	1350
8 x 8	512	544	576	608	640	672	704	768
8 x 8½	544	578	612	646	680	714	748	816
8 x 9	576	612	648	684	720	756	792	864
8 x 9½	608	646	684	722	760	798	836	912
8 x10	640	680	720	760	800	840	880	960
8 x10½	672	714	756	798	840	882	924	1008
8 x11	704	748	792	830	880	924	968	1056
8 x11½	736	782	828	874	920	966	1012	1104
8 x12	768	816	864	912	960	1008	1056	1152
8 x12½	800	850	900	950	1000	1050	1100	1200
8 x13	832	884	936	988	1040	1092	1144	1248
8 x13½	864	918	972	1026	1080	1134	1188	1296
8 x14	896	952	1008	1064	1120	1176	1232	1344
8 x14½	928	986	1044	1102	1160	1218	1276	1392
8 x15	960	1020	1080	1140	1200	1260	1320	1440
8 x15½	992	1054	1116	1178	1240	1302	1364	1488
8 x16	1024	1088	1152	1216	1280	1344	1408	1536
8½x 8½	578	614	650	686	723	759	794	867
8½x 9	612	650	689	726	765	803	841	918
8½x 9½	646	686	727	767	808	848	888	969
8½x10	680	723	765	807	850	893	935	1020
8½x10½	714	759	803	847	893	937	981	1071
8½x11	748	795	842	888	935	982	1028	1122
8½x11½	782	831	880	928	978	1026	1075	1173
8½x12	816	867	918	969	1020	1071	1122	1224
8½x12½	850	903	956	1009	1063	1116	1168	1275
8½x13	884	939	995	1049	1105	1160	1215	1326
8½x13½	918	975	1033	1090	1148	1205	1262	1377
8½x14	952	1012	1071	1130	1190	1250	1309	1428
8½x14½	986	1048	1109	1170	1233	1294	1355	1479
8½x15	1020	1084	1148	1211	1275	1339	1402	1530
8½x15½	1054	1120	1186	1251	1318	1383	1449	1581
8½x16	1088	1156	1224	1292	1360	1428	1496	1632
8½x16½	1122	1192	1262	1332	1403	1473	1542	1683
8½x17	1156	1228	1301	1372	1445	1517	1589	1734
9 x 9	648	689	729	769	810	851	891	972
9 x 9½	684	727	770	812	855	898	940	1026
9 x10	720	765	810	855	900	945	990	1080
9 x10½	756	803	851	897	945	992	1039	1134
9 x11	792	842	891	940	990	1040	1089	1188
9 x11½	823	880	932	982	1035	1087	1138	1242
9 x12	864	918	972	1026	1080	1134	1188	1296
9 x12½	900	956	1013	1068	1125	1181	1237	1350
9 x13	936	995	1053	1111	1170	1229	1287	1404
9 x13½	972	1033	1094	1154	1215	1276	1336	1458
9 x14	1008	1071	1134	1197	1260	1323	1386	1512
9 x14½	1044	1109	1175	1239	1305	1370	1435	1566

Table of Cubical Contents (Continued)

Ceiling Heights

Room Size	8 ft.	8½ ft.	9 ft.	9½ ft.	10 ft.	10½ ft.	11 ft.	12 ft.
9 x15	1080	1148	1215	1282	1350	1418	1485	1620
9 x15½	1116	1186	1256	1325	1395	1465	1534	1674
9 x16	1152	1224	1296	1368	1440	1512	1584	1728
9 x16½	1188	1262	1337	1410	1485	1559	1633	1782
9 x17	1224	1301	1377	1453	1530	1607	1683	1836
9 x17½	1260	1339	1418	1496	1575	1654	1732	1890
9 x18	1296	1377	1458	1539	1620	1701	1782	1944
9½x 9½	722	767	812	857	903	948	992	1083
9½x10	760	808	855	902	950	998	1045	1140
9½x10½	798	848	898	947	998	1047	1097	1197
9½x11	836	888	940	992	1045	1097	1149	1254
9½x11½	874	929	983	1038	1093	1147	1201	1311
9½x12	912	969	1026	1083	1140	1197	1254	1368
9½x12½	950	1009	1069	1128	1188	1247	1306	1425
9½x13	988	1050	1111	1173	1235	1297	1358	1482
9½x13½	1026	1090	1154	1218	1283	1347	1410	1539
9½x14	1064	1131	1197	1263	1330	1397	1463	1596
9½x14½	1102	1171	1240	1308	1378	1446	1515	1653
9½x15	1140	1211	1282	1353	1425	1496	1567	1710
9½x15½	1178	1252	1325	1398	1473	1546	1619	1767
9½x16	1216	1292	1368	1444	1520	1596	1672	1824
9½x16½	1254	1332	1411	1489	1568	1646	1724	1881
9½x17	1292	1373	1453	1534	1615	1696	1776	1938
9½x17½	1330	1413	1496	1579	1663	1746	1828	1995
9½x18	1368	1454	1539	1624	1710	1796	1881	2052
9½x18½	1406	1494	1582	1669	1758	1845	1933	2109
9½x19	1444	1534	1625	1714	1805	1895	1985	2166
10 x10	800	850	900	950	1000	1050	1100	1200
10 x10½	840	893	945	997	1050	1103	1155	1260
10 x11	880	935	990	1045	1100	1155	1210	1320
10 x11½	920	978	1035	1092	1150	1208	1265	1380
10 x12	960	1020	1080	1140	1200	1260	1320	1440
10 x12½	1000	1063	1125	1187	1250	1313	1375	1500
10 x13	1040	1105	1170	1235	1300	1365	1430	1560
10 x13½	1080	1148	1215	1282	1350	1418	1485	1620
10 x14	1120	1190	1260	1330	1400	1470	1540	1680
10 x14½	1160	1233	1305	1377	1450	1523	1595	1740
10 x15	1200	1275	1350	1425	1500	1575	1650	1800
10 x15½	1240	1318	1395	1472	1550	1628	1705	1860
10 x16	1280	1360	1440	1520	1600	1680	1760	1920
10 x16½	1320	1403	1485	1567	1650	1733	1815	1980
10 x17	1360	1445	1530	1615	1700	1785	1870	2040
10 x17½	1400	1488	1575	1662	1750	1838	1925	2100
10 x18	1440	1530	1620	1710	1800	1890	1980	2160
10 x18½	1480	1573	1665	1757	1850	1943	2035	2220
10 x19	1520	1615	1710	1805	1900	1995	2090	2280
10 x19½	1560	1658	1755	1852	1950	2048	2145	2340
10 x20	1600	1700	1800	1900	2000	2100	2200	2400
11 x11	968	1029	1089	1149	1210	1271	1331	1452
11 x12	1056	1122	1188	1254	1320	1386	1452	1584
11 x13	1144	1216	1287	1358	1430	1502	1573	1716
11 x14	1232	1309	1386	1463	1540	1617	1694	1848
11 x15	1320	1403	1485	1567	1650	1733	1815	1980
11 x16	1408	1496	1584	1672	1760	1848	1936	2112

Table of Cubical Contents (Continued)

Ceiling Heights

Room Size	8 ft.	8½ ft.	9 ft.	9½ ft.	10 ft.	10½ ft.	11 ft.	12 ft.
11x17	1496	1590	1683	1776	1870	1964	2057	2244
11x18	1584	1683	1782	1881	1980	2079	2178	2376
11x19	1672	1777	1881	1986	2090	2195	2299	2508
11x20	1760	1870	1980	2090	2200	2310	2420	2640
11x21	1848	1964	2079	2194	2310	2426	2541	2772
11x22	1936	2057	2178	2299	2420	2541	2662	2904
12x12	1152	1224	1296	1368	1440	1512	1584	1728
12x13	1248	1326	1404	1482	1560	1638	1716	1872
12x14	1344	1428	1512	1596	1680	1764	1848	2016
12x15	1440	1530	1620	1710	1800	1890	1980	2160
12x16	1536	1632	1728	1824	1920	2016	2112	2304
12x17	1632	1734	1836	1938	2040	2142	2244	2448
12x18	1728	1836	1944	2052	2160	2268	2376	2592
12x19	1824	1938	2052	2166	2280	2394	2508	2736
12x20	1920	2040	2160	2280	2400	2520	2640	2880
12x21	2016	2142	2268	2394	2520	2646	2772	3024
12x22	2112	2244	2376	2508	2640	2772	2904	3168
12x23	2208	2346	2484	2622	2760	2898	3036	3312
12x24	2304	2448	2592	2736	2880	3024	3168	3456
13x13	1352	1437	1521	1605	1690	1775	1859	2028
13x14	1456	1547	1638	1729	1820	1911	2002	2184
13x15	1560	1658	1755	1852	1950	2048	2145	2340
13x16	1664	1768	1872	1976	2080	2184	2288	2496
13x17	1768	1879	1989	2099	2210	2321	2431	2652
13x18	1872	1989	2106	2223	2340	2457	2574	2808
13x19	1976	2100	2223	2346	2470	2594	2717	2964
13x20	2080	2210	2340	2470	2600	2730	2860	3120
13x21	2184	2321	2457	2593	2730	2867	3003	3276
13x22	2288	2431	2574	2717	2860	3003	3146	3432
13x23	2392	2542	2691	2840	2990	3140	3289	3588
13x24	2496	2652	2808	2964	3120	3276	3432	3744
13x25	2600	2763	2925	3087	3250	3413	3575	3900
13x26	2704	2873	3042	3211	3380	3549	3718	4056
14x14	1568	1666	1764	1862	1960	2058	2156	2352
14x15	1680	1785	1890	1995	2100	2205	2310	2520
14x16	1792	1904	2016	2128	2240	2352	2464	2688
14x17	1904	2023	2142	2261	2380	2499	2618	2856
14x18	2016	2142	2268	2394	2520	2646	2772	3024
14x19	2128	2261	2394	2527	2660	2793	2926	3192
14x20	2240	2380	2520	2660	2800	2940	3080	3360
14x21	2352	2499	2646	2793	2940	3087	3234	3528
14x22	2464	2618	2772	2926	3080	3234	3388	3696
14x23	2576	2737	2898	3059	3220	3381	3542	3864
14x24	2688	2856	3024	3192	3360	3528	3696	4032
14x25	2800	2975	3150	3325	3500	3675	3850	4200
14x26	2912	3094	3276	3458	3640	3822	4004	4368
14x27	3024	3213	3402	3591	3780	3969	4158	4536
14x28	3136	3332	3528	3724	3920	4116	4312	4704
15x15	1800	1913	2025	2137	2250	2363	2475	2700
15x16	1920	2040	2160	2280	2400	2520	2640	2880
15x17	2040	2168	2295	2422	2550	2678	2805	3060

Table of Cubical Contents (Continued)

Ceiling Heights

Room Size	8 ft.	8½ ft.	9 ft.	9½ ft.	10 ft.	10½ ft.	11 ft.	12 ft.
15x18	2160	2295	2430	2565	2700	2835	2970	3240
15x19	2280	2423	2565	2707	2850	2993	3135	3420
15x20	2400	2550	2700	2850	3000	3150	3300	3600
15x21	2520	2678	2835	2992	3150	3308	3465	3780
15x22	2640	2805	2970	3135	3300	3465	3630	3960
15x23	2760	2933	3105	3277	3450	3623	3795	4140
15x24	2880	3060	3240	3420	3600	3780	3960	4320
15x25	3000	3188	3375	3562	3750	3938	4125	4500
15x26	3120	3315	3510	3705	3900	4095	4290	4680
15x27	3240	3443	3645	3847	4050	4253	4455	4860
15x28	3360	3570	3780	3990	4200	4410	4620	5040
15x29	3480	3608	3915	4132	4350	4568	4785	5220
15x30	3600	3825	4050	4275	4500	4725	4950	5400
16x16	2048	2176	2304	2432	2560	2688	2816	3072
16x17	2176	2312	2448	2584	2720	2856	2992	3264
16x18	2304	2448	2592	2736	2880	3024	3168	3456
16x19	2432	2584	2736	2888	3040	3192	3344	3648
16x20	2560	2720	2880	3040	3200	3360	3520	3840
16x21	2688	2856	3024	3192	3360	3528	3696	4032
16x22	2816	2992	3168	3344	3520	3696	3872	4224
16x23	2944	3128	3312	3496	3680	3864	4048	4416
16x24	3072	3264	3456	3648	3840	4032	4224	4608
16x25	3200	3400	3600	3800	4000	4200	4400	4800
16x26	3328	3536	3744	3952	4160	4368	4576	4992
16x27	3456	3672	3888	4104	4320	4536	4752	5184
16x28	3584	3808	4032	4256	4480	4704	4928	5376
16x29	3712	3944	4176	4408	4640	4872	5104	5568
16x30	3840	4080	4320	4560	4800	5040	5280	5760
16x31	3968	4216	4464	4712	4960	5208	5456	5952
16x32	4096	4352	4608	4864	5120	5376	5632	6144
18x18	2592	2754	2916	3078	3240	3402	3564	3888
18x20	2880	3060	3240	3420	3600	3780	3960	4320
18x22	3168	3366	3564	3762	3960	4158	4356	4752
18x24	3456	3672	3888	4104	4320	4536	4752	5184
18x26	3744	3978	4212	4446	4680	4914	5148	5616
18x28	4032	4284	4536	4788	5040	5292	5544	6048
18x30	4320	4590	4860	5130	5400	5670	5940	6480
18x32	4608	4896	5184	5472	5760	6048	6336	6912
18x34	4896	5202	5508	5814	6120	6426	6732	7344
18x36	5184	5508	5832	6156	6480	6804	7128	7776
20x20	3200	3400	3600	3800	4000	4200	4400	4800
20x22	3520	3740	3960	4180	4400	4620	4840	5280
20x24	3840	4080	4320	4560	4800	5040	5280	5760
20x26	4160	4420	4680	4940	5200	5460	5720	6240
20x28	4480	4760	5040	5320	5600	5880	6160	6720
20x30	4800	5100	5400	5700	6000	6300	6600	7200
20x32	5120	5440	5760	6080	6400	6720	7040	7680
20x34	5440	5780	6120	6460	6800	7140	7480	8160
20x36	5760	6120	6480	6840	7200	7560	7920	8640
20x38	6080	6460	6840	7220	7600	7980	8360	9120
20x40	6400	6800	7200	7600	8000	8400	8800	9600

Directions for Installing Clow Booster With Richardson Intensified System

Shown Under "Specialties"

This valve can be connected directly underneath the expansion tank, as shown by cut, but when so connected the pressure produced by the weight in the valve will be recorded on the altitude gauge, preventing the true height of water in the tank from being shown. Such heights can only be determined when the water has contracted to a normal condition.

A much better way to install the Clow Booster is at the boiler as shown. By doing so, the height of the water in the expansion tank will be recorded correctly at all times.

On Hot Water Systems having 1200 square feet of radiation or less a ¾-inch pipe is of sufficient size to connect the Clow Booster to the expansion tank; over 1200 square feet of radiation 1-inch pipe should be used.

The valve is sent set at ten pounds.

Valve Sizes

In connection with the "Richardson Intensified System," we append the following valve sizes for radiators:

First Floor

Up to 18 square feet	½-inch valves
From 18 to 60 square feet	¾-inch valves
Over 60 square feet	1-inch valves

Second Floor

Up to 25 square feet	½-inch valves
From 25 to 100 square feet	¾-inch valves
Over 100 square feet	1-inch valves

Third Floor

Up to 35 square feet	½-inch valves
From 35 to 120 square feet	¾-inch valves
Over 120 square feet	1-inch valves

Pipe Areas

½ inch	.20 square inches
¾ inch	.44 square inches
1 inch	.78 square inches
1¼ inches	1.22 square inches
1½ inches	1.76 square inches
2 inches	3.14 square inches
2½ inches	4.90 square inches
3 inches	7.06 square inches
3½ inches	9.62 square inches
4 inches	12.56 square inches
4½ inches	15.90 square inches
5 inches	19.63 square inches
6 inches	28.67 square inches
7 inches	38.48 square inches
8 inches	50.26 square inches
10 inches	78.54 square inches

Size of Mains

Size of steam mains for direct radiation

Size of pipe Inches	Square feet of radiation	Size of return Inches
1	36	¾
1¼	72	1
1½	120	1¼
2	280	1½
2½	525	2
3	900	2½
3½	1300	2½
4	1900	3
5	3700	3½
6	6000	3½
8	12000	4

Size of mains and returns for hot water, open tank direct radiation

Size of mains and returns Inches	Square feet of Radiation
1	50
1¼	80
1½	125
2	200
2½	325
3	500
3½	700
4	1000
5	1650
6	2750
8	5000

In proportioning size of steam and hot water mains due allowance must be made for unusual conditions, length of mains and elevation.

Number and Size of Branches Main will Supply

Main	Branch

1¼-inch will supply 1–1-inch and 1–¾-inch
1½-inch will supply 1–1¼-inch and 1–¾-inch
2-inch will supply 1–1½-inch and 1–1¼-inch
2½-inch will supply 2–1½-inch and 1–1¼-inch or 1–2-inch and 1–1¼-inch
3-inch will supply 1–2½-inch and 1–1½-inch or 2–2-inch and 1–1-inch
3½-inch will supply 2–2½-inch or 1–3-inch and 1–1½-inch or 2–2-inch and 1–1½-inch
4-inch will supply 1–3-inch and 1–2½-inch or 1–3-inch and 1–2-inch and 1–1½-inch
5-inch will supply 1–4-inch and 1–3-inch or 1–4½-inch and 1–2-inch

Number and Size of Branches Main will Supply
(Continued)

6-inch will supply 2–4-inch and 1–2-inch or 4–3-inch or 9–2-inch
8-inch will supply 1–6-inch and 1–5-inch or 4–4-inch

Size of Expansion Tanks Required

Square feet of Radiation	Capacity of Tank Gallons
400	10
600	15
800	20
1000	24
1500	32
2000	42
3000	66

Hanging Indirect Stacks

Indirect stacks to obtain best results and for cleanliness should be hung to one side of the register or warm air duct, with the warm air supply taken from the end close to the top and the cold air supply connected to the opposite end at the bottom. Casings should fit close to sides and ends of stacks, with a twelve-inch warm air space left over stack and a ten-inch cold air space below stack.

Air Supply for Indirects

To determine the size of ducts in square inches required in indirect heating, multiply the square feet of indirect radiation by the proper co-efficient taken from the following table:

	First Floor	Second Floor	Other Floors
Steam	1.5 to 2.0	1.0 to 1.25	.9 to 1.0
Water	1.0 to 1.33	.66 to .83	.6 to .66

Make vent ducts .8 the size of supply ducts.

The amount of air in cubic feet per hour which may reasonably be expected to enter through ducts proportioned as above may be determined by multiplying the square feet of indirect radiation by the proper co-efficient taken from the following table:

	First Floor	Second Floor	Other Floors
Steam	200	170	150
Water	150	130	115

If the amount of air as shown above is insufficient for ventilation, more air must be brought in by corresponding larger ducts, and one square foot should be added to the steam radiating surface for each 300 cubic feet per hour additional air, and one square foot hot water radiating surface for each additional 200 cubic feet.

B. T. U. Required for Heating Air

This table specifies the quantity of heat in British thermal units required to raise one cubic foot of air through any given temperature interval

External Temperature	Temperature of Air in Room									
	40°	50°	60°	70°	80°	90°	100°	110°	120°	130°
-40°	1.802	2.027	2.252	2.479	2.703	2.928	3.154	3.379	3.604	3.829
-30°	1.540	1.760	1.980	2.200	2.420	2.640	2.860	3.080	3.300	3.520
-20°	1.290	1.505	1.720	1.935	2.150	2.365	2.580	2.795	3.010	3.225
-10°	1.051	1.262	1.473	1.684	1.892	2.102	2.311	2.522	2.732	2.943
0°	0.822	1.028	1.234	1.439	1.645	1.851	2.056	2.262	2.467	2.673
10°	0.604	0.805	1.007	1.208	1.409	1.611	1.812	2.013	2.215	2.416
20°	0.393	0.590	0.787	0.984	1.181	1.378	1.575	1.771	1.968	2.165
30°	0.192	0.385	0.578	0.770	0.963	1.155	1.345	1.540	1.733	1.925
40°	0.000	0.188	0.376	0.564	0.752	0.940	1.128	1.316	1.504	1.692
50°	0.000	0.000	0.184	0.367	0.551	0.735	0.918	1.102	1.286	1.470
60°	0.000	0.000	0.000	0.179	0.359	0.538	0.718	0.897	1.077	1.256
70°	0.000	0.000	0.000	0.000	0.175	0.350	0.525	0.700	0.875	1.049

Galvanized Sheet Iron Pipe

Table of weights of Galvanized Iron Pipe, in pounds per lineal foot

Diameter of Pipe in Inches	Number of Gauge						
	28	26	24	22	20	18	16
6	1.4	1.75	2.0	2.25	3.0	3.75	4.75
7	1.7	2.0	2.25	2.75	3.5	4.5	5.5
8	1.9	2.25	2.75	3.0	4.0	5.25	6.75
9	2.2	2.4	3.0	3.25	4.5	5.75	7.0
10	2.4	2.5	3.25	3.5	4.75	6.25	7.75
11		2.75	3.5	3.75	5.25	6.75	8.25
12		3.0	3.75	4.25	5.75	7.5	9.0
13		3.25	4.0	4.5	6.25	8.0	10.0
14		3.5	4.25	4.75	6.75	8.5	11.0
15		3.75	4.75	5.25	7.25	9.25	12.0
16		4.0	5.0	5.5	7.75	9.75	13.0
17		4.25	5.25	6.0	8.0	10.25	13.75
18		4.5	5.5	6.25	8.5	10.75	14.25
19		4.75	5.75	6.75	9.0	11.5	15.0
20		5.25	6.0	7.0	9.5	12.0	15.5
21		5.5	6.5	7.5	9.75	12.5	16.0
22		5.75	6.75	7.75	10.25	13.25	16.75
23		6.0	7.0	8.25	11.0	14.0	17.5
24		6.5	7.5	8.75	11.5	14.75	18.5
26			7.75	9.25	12.5	15.75	20.0
28			8.5	9.75	13.5	16.75	21.5
30			9.0	10.5	14.0	18.0	23.0

Square Feet of Radiating Surface of Pipe per Lineal Foot

On all lengths over one foot, fractions less than tenths are added to or dropped

Length of Pipe	Size of Pipe											
	¾	1	1¼	1½	2	2½	3	4	5	6	7	8
1	.275	.346	.434	.494	.622	.753	.916	1.175	1.455	1.739	1.996	2.257
2	.5	.7	.9	1.	1.2	1.5	1.8	2.4	2.9	3.5	4.	4.5
3	.8	1.	1.3	1.5	1.9	2.3	2.7	3.5	4.4	5.2	6.	6.8
4	1.1	1.4	1.7	2.	2.5	3.	3.6	4.7	5.8	7.	8.	9.
5	1.4	1.7	2.2	2.4	3.1	3.8	4.6	5.8	7.3	7.7	10.	11.3
6	1.6	2.1	2.6	2.9	3.7	4.5	5.5	7.	8.7	10.5	12.	13.5
7	1.9	2.4	3.	3.4	4.4	5.3	6.4	8.2	10.2	12.1	14.	15.8
8	2.2	2.8	3.5	3.9	5.	6.	7.3	9.4	11.6	13.9	16.	18.
9	2.5	3.1	3.9	4.4	5.6	6.8	8.2	10.6	13.1	15.7	18.	20.3
10	2.7	3.5	4.3	4.9	6.2	7.5	9.1	11.8	14.6	17.4	20.	22.6
11	3.	3.8	4.8	5.4	6.8	8.3	10.	12.9	16.	19.1	22.	24.9
12	3.3	4.1	5.2	5.9	7.5	9.	11.	14.1	17.4	20.9	24.	27.1
13	3.6	4.5	5.6	6.4	8.1	9.8	11.9	15.3	18.9	22.6	26.	29.4
14	3.8	4.8	6.1	6.9	8.7	10.5	12.8	16.5	20.3	24.3	28.	31.6
15	4.1	5.2	6.5	7.4	9.3	11.3	13.7	17.6	21.8	26.1	30.	33.9
16	4.4	5.5	6.9	7.9	10.	12.	14.6	18.8	23.2	27.8	32.	36.1
17	4.7	5.9	7.4	8.4	10.6	12.8	15.5	20.	24.7	29.5	34.	38.4
18	5.	6.2	7.8	8.9	11.2	13.5	16.5	21.2	26.2	31.3	36.	40.6
19	5.2	6.6	8.3	9.4	11.8	14.3	17.4	22.3	27.6	33.1	38.	42.9
20	5.5	6.9	8.7	9.9	12.5	15.	18.3	23.5	29.1	34.8	40.	45.2
21	5.8	7.3	9.1	10.4	13.	15.8	19.2	24.7	30.5	36.5	42.	47.4
22	6.	7.6	9.6	10.9	13.7	16.5	20.2	25.9	32.	38.3	44.	49.7
23	6.3	8.	10.	11.3	14.3	17.3	21.1	27.	33.5	40.	46.	52.
24	6.6	8.3	10.4	11.9	14.9	18.	22.	28.2	34.9	41.7	48.	54.2
25	6.9	8.6	10.9	12.3	15.6	18.8	22.9	29.3	36.3	43.5	50.	56.4
26	7.1	9.	11.3	12.8	16.2	19.5	23.8	30.5	37.8	45.2	52.	58.6
27	7.4	9.4	11.7	13.3	16.8	20.3	24.7	31.7	39.3	47.	54.	61.
28	7.7	9.7	12.2	13.8	17.4	21.	25.6	32.9	40.7	48.7	56.	63.2
29	8.	10.	12.6	14.3	18.	21.8	26.6	34.1	42.2	50.4	58.	65.5
30	8.3	10.4	13.	14.8	18.7	22.5	27.5	35.2	43.6	52.1	60.	67.7
31	8.5	10.7	13.5	15.3	19.3	23.3	28.4	36.4	45.1	53.9	62.	70.
32	8.8	11.1	13.9	15.8	19.9	24.1	29.3	37.6	46.5	55.6	64.	72.2
33	9.1	11.4	14.3	16.3	20.5	24.8	30.2	38.8	48.	57.4	66.	74.4
34	9.4	11.7	14.7	16.8	21.2	25.6	31.1	40.	49.5	59.1	68.	76.7
35	9.6	12.1	15.2	17.3	21.8	26.3	32.	41.1	50.9	60.8	70.	79.
36	9.9	12.5	15.6	17.8	22.4	27.	33.	42.3	52.4	62.6	72.	81.3
37	10.2	12.8	16.1	18.3	23.	27.8	33.9	43.5	53.8	64.3	74.	83.5
38	10.5	13.2	16.5	18.8	23.7	28.5	34.8	44.6	55.2	66.	76.	85.8
39	10.7	13.5	16.9	19.3	24.3	29.3	35.7	45.8	56.7	67.8	78.	88.
40	11.	13.8	17.4	19.8	24.9	30.1	36.6	47.	58.2	69.5	80.	90.2
41	11.3	14.2	17.8	20.3	25.5	30.8	37.6	48.2	59.6	71.3	82.	92.5
42	11.5	14.5	18.2	20.8	26.1	31.6	38.5	49.4	61.1	73.	84.	94.8
43	11.8	14.9	18.7	21.3	26.8	32.3	39.4	50.6	62.5	74.8	86.	97.
44	12.1	15.2	19.1	21.8	27.4	33.1	40.3	51.7	64.	76.5	88.	99.3
45	12.4	15.6	19.5	22.2	28.	33.8	41.2	52.9	65.5	78.2	90.	101.6
46	12.7	15.9	20.	22.7	28.6	34.6	42.2	54.	67.	80.	92.	103.8
47	12.9	16.3	20.4	23.2	29.2	35.3	43.	55.2	68.4	81.7	94.	106.
48	13.2	16.6	20.8	23.7	29.9	36.1	43.9	56 4	69.8	83.5	96.	108.4
49	13.5	17.	21.3	24.2	30.5	36.8	44.8	57.6	71.2	85.1	98.	110.5
50	13.8	17.3	21.7	24.7	31.1	37.6	45.8	58.7	72.7	87.	100.	112.8

Dimensions of Standard Pipe

Nominal Internal Diam.	Actual Internal Diam.	Circumference External	Internal Areas	Length of Pipe per Sq. Ft. of External Surface	Length of Pipe Containing One Cu. Ft.	Nominal Weight per Ft.	Weight Water per Lineal Ft.
Inches	Inches	Inches	Sq. Inches	Feet	Feet	Pounds	Pounds
¼	.364	1.696	.1041	7.075	1383.3	.42	.044
⅜	.494	2.121	.1917	5.657	751.2	.559	.083
½	.623	2.639	.3048	4.547	472.4	.837	.132
¾	.824	3.299	.5333	3.637	270.	1.115	.231
1	1.048	4.131	.8626	2.904	166.9	1.668	.373
1¼	1.38	5.215	1.496	2.301	96.25	2.244	.648
1½	1.611	5.969	2.038	2.01	70.66	2.678	.882
2	2.067	7.461	3.356	1.608	42.91	3.609	1.453
2½	2.468	9.032	4.784	1.328	30.1	5.739	2.074
3	3.067	10.996	7.388	1.091	19.5	7.536	3.200
3½	3.548	12.566	9.887	.955	14.57	9.001	4.281
4	4.026	14.137	12.73	.849	11.31	10.665	5.512
4½	4.508	15.708	15.961	.764	9.02	12.49	6.911
5	5.045	17.477	19.99	.687	7.2	14.502	8.656
6	6.065	20.813	28.888	.577	4.98	18.762	12.509
7	7.023	23.955	38.738	.501	3.72	23.271	16.774
8	7.982	27.096	50.04	.443	2.88	28.177	21.667
9	8.937	30.238	62.73	.397	2.29	33.701	27.162
10	10.019	33.772	78.839	.355	1.82	40.065	34.137
11	11.	36.914	95.033	.325	1.51	45.028	41.150
12	12.	40.055	113.098	.299	1.27	48.985	48.971

Temperature of Steam

Pressure in Lbs. per Sq. In. Above Vacuum	Temperature in Degrees Fah. Fractions Omitted	Pressure in Lbs. per Sq. In. Above Atmosphere	Temperature in Degrees Fah. Fractions Omitted
1	102	0	212
2	126	½	214
3	142	1	215
4	153	1½	217
5	162	2	219
6	170	2½	221
7	177	3	222
8	183	3½	224
9	188	4	225
10	193	5	227
11	198	10	239
12	202	15	250
13	206	20	259
14	209	26	269

"Atmosphere" = 14.7 lbs. above vacuum.

Heat Units in Water

Between 32° and 212° Fah.

Temp. Deg. F.	Heat Units	Temp. Deg. F.	Heat Units	Temp. Deg. F.	Heat Units	Temp. Deg. F.	Heat Units
32	0	84	52	120	88	160	128
40	8	90	58	122	90	162	130
45	13	96	64	125	93	165	133
50	18	98	66	130	98	167	135
52	20	100	68	133	101	170	138
60	28	102	70	135	103	172	140
64	32	104	72	140	108	175	144
66	34	108	76	145	113	180	148
70	38	110	78	150	118	190	159
72	40	112	80	152	120	200	169
76	44	115	83	155	123	210	179
80	48	118	86	157	125	212	181

Pressure of Water for Each Foot in Height

Feet in Height	Pounds per Sq. Inch	Feet in Height	Pounds per Sq. Inch	Feet in Height	Pounds per Sq. Inch
1	.43	15	6.49	50	21.65
2	.86	20	8.66	70	30.32
5	2.16	25	10.82	80	34.65
10	4.33	40	17.32	100	43.31

Fan Blast Heating

Where provision is to be made for positive ventilation, as in public schools, hospitals, etc., it is customary to allow 30 cubic feet of air at 70 degrees per minute for each occupant. The air is either blown or drawn through pipe coil or cast iron blast heaters by a centrifugal fan, and distributed through the building by means of galvanized iron ducts. The quantity of air per minute required depends on the probable number of occupants, and equals

$$Q = 30\ N$$

in which Q = quantity of air in cubic feet per minute.
N = number of occupants.

The general relation between the quantity of air required, the number of occupants, the room temperature, and the temperature of the air entering the room, is given by the following formula

$$H = \frac{60Q\ (t_f - t_r)}{55}$$

in which Q, as before = quantity of air in cubic feet per minute

H = heat loss in B. T. U. per hour.
t_f = temperature of air entering room from warm air flue.
t_r = room temperature.

From this we find the temperature at which Q cubic feet of air per minute must be brought into the room to maintain a room temperature of t_r,

$$t_f = \frac{55H}{60Q} + t_r$$

in which the symbols have the same value as before.

To determine the size of ducts for such a system allow the following air velocities in the different parts of the system.

	Fresh Air Intake	Through Blast Heaters	Main Duct Near Fan	Smaller Branch Ducts	Stacks	Registers or Other Openings
Offices, Schools, etc.	850	1000	1500	900	600	300
Auditoriums, Churches, etc.,	850	1000	1800	1200	700	400
Shops and Factories	850	1000	2000	1500	800	500

In using this table it should be borne in mind that the volume of air will be greater after leaving the blast heater than at the room temperature, 70 degrees, and in determining duct sizes, the quantity Q should be multiplied by $\frac{t_f+460}{530}$ to find the actual quantity of air passing through the ducts.

The proper size blast heater and fan may be determined by referring to catalogues of reputable makers of those devices, care being taken to allow sufficient static resistance for the system so that the fan may be amply large.

To determine the size of boiler required for such a system, after the quantity of air and the temperature to which it must be heated are known, use the following formula:—

$$R = .00437\ Q\ (t_f - t_o).$$

in which R = required boiler capacity in square feet of direct steam radiation.

Q = cubic feet of air at 70 degrees required per minute.

t_f = temperature to which air must be heated.

t_o = temperature of outside air.

To the above boiler capacity must be added any direct radiation which may form a part of the system, together with a fair allowance for radiation from piping, ducts, etc.

Humidity

The term *humidity*, as applied to the air we breathe, refers to the amount of moisture present in the air in the form of water vapor. It may be indicated in either of two ways—as *absolute humidity*, by which term we mean the actual amount of moisture present in a cubic foot of air at a given temperature and percentage of saturation, and which is usually expressed as grains per cubic foot; or as *relative humidity*, by which term we mean the ratio of the weight of water vapor in a given space as compared with the weight which the same space is capable of containing when fully saturated at the same temperature. Or, to express the same idea in different words, the relative humidity of air at any temperature and percentage of saturation is the ratio of the absolute humidity for the given condition to the absolute humidity at saturation.

If air at any temperature and percentage of saturation is cooled without any moisture being added to or taken from the air, the temperature at which saturation is obtained, or the point where any further reduction in temperature would cause condensation of some of the water vapor, is called the *dew point*.

It must be borne in mind that the weight of water vapor a given space will hold is dependent entirely on its temperature. The amount of vapor in any given space is independent of the presence of air, the only effect the air has being due to its temperature. The converse is not true, however, as the presence of water vapor in any space makes it impossible for as much air to be present as though the air were perfectly dry.

The most reliable and most generally used instruments for measuring the humidity in the air have as their basic features a dry bulb and a wet bulb thermometer. The dry bulb thermometer indicates the temperature of the air and vapor, and the difference between the dry and wet bulb thermometers indicates the degree of humidity. If any body moistened with water be placed in a current of air some of its moisture

will be evaporated, depending on the humidity of the air passing over it. This evaporation will extract heat from the moist body and cool it, when, it being cooler than the air current, this air will give up some heat to it. This operation will be continued until the moist body reaches a temperature at which the amount of heat it loses as a result of evaporation is equal to the amount of heat which the air gives up to the moist body. Its temperature will then remain constant, and this temperature is the *wet bulb temperature.*

This is the precise manner in which the air acts upon the human body, and it can be readily seen that the temperature felt by the body, or the sensible temperature, as it is called, corresponds to the temperature of the wet bulb thermometer; hence the drier the air, the greater the difference between the actual and sensible temperature. Dry air heated considerably above the normal will still be chilly, slight drafts are very noticeable and colds are easily contracted.

We give below tables showing the relative humidity for different dry bulb temperatures and different wet bulb depressions, and also the various properties of dry air and mixtures of air and vapor.

Air Temp.	Relative Humidities Difference Between Dry and Wet Bulb Thermometers																		
	0	2	4	6	8	10	12	14	16	18	20	22	24	26	28	30	32	34	36
30	100	78	57	36	17														
35	100	82	65	45	28	12													
40	100	84	68	53	38	22	8												
45	100	85	71	58	44	32	19	7											
50	100	87	74	61	50	38	27	16	6										
55	100	88	76	65	54	43	34	24	16	6									
60	100	89	78	68	58	48	39	30	22	14	6								
65	100	90	80	70	61	52	44	35	28	20	13	6							
70	100	90	81	72	64	55	48	40	33	26	19	13	7	1					
75	100	91	82	74	66	58	51	44	37	31	24	19	13	7	2				
80	100	92	83	75	68	61	54	47	41	35	29	23	18	13	8	3			
85	100	92	84	77	70	63	56	50	44	38	33	28	22	17	13	9	4		
90	100	92	85	78	71	65	59	53	47	41	36	32	26	22	17	13	9	5	2
95	100	93	86	79	72	66	60	55	49	44	39	35	30	25	21	17	13	10	6
100	100	93	86	80	74	68	62	57	51	47	42	37	33	29	25	21	17	14	10
105	100	93	87	81	75	69	64	58	53	49	44	40	35	31	28	24	20	17	14
110	100	94	87	81	76	70	65	60	55	50	46	42	38	34	30	27	23	20	17
115	100	94	88	82	76	71	66	61	57	52	48	44	40	36	33	29	26	23	20
120	100	94	88	83	77	72	67	62	58	54	49	45	42	38	35	31	28	25	22
125	100	94	88	83	78	73	68	64	59	55	51	47	43	40	37	33	30	27	24
130	100	94	89	83	78	74	69	65	61	56	52	49	45	42	38	35	32	29	27
135	100	94	89	84	79	74	70	65	61	57	53	50	46	43	40	37	34	31	28
140	100	95	89	84	79	75	71	66	62	58	55	51	48	44	41	38	35	33	30

Properties of Dry Air and Mixture of Air and Water Vapor at a Barometric Pressure of 29.921 inches of Mercury

Temperature Fahrenheit	Weight of a Cu. Ft. of Dry Air in Pounds	Elastic Force of Vapor in Inches of Mercury	Mixtures of Air Saturated with Vapor: Elastic Force of Air in the Mixture Inches of Mercury	Weight of a cubic foot of the Mixture in Pounds: Air	Vapor	Mixture	Cubic Feet of Dry Air Warmed One Degree per B. t. u.
1	2	3	4	5	6	7	8
0	.0864	0.044	29.877	.0863	.000079	.086379	48.5
12	.0842	0.074	29.849	.0840	.000130	.084130	50.1
22	.0824	0.118	29.803	.0821	.000202	.082302	51.1
32	.0807	0.181	29.740	.0802	.000304	.080504	52.0
42	.0791	0.267	29.654	.0784	.000404	.078840	53.2
52	.0766	0.388	29.533	.0766	.000627	.077227	54.0
60	.0764	0.522	29.399	.0751	.000830	.075252	55.0
62	.0761	0.556	29.365	.0747	.000881	.075581	55.2
70	.0750	0.754	29.182	.0731	.001153	.073509	56.2
72	.0747	0.785	29.136	.0727	.001221	.073921	56.3
82	.0733	1.092	28.829	.0706	.001667	.072267	57.2
92	.0720	1.501	28.420	.0684	.002250	.070717	58.4
100	.0710	1.929	27.992	.0664	.002848	.069261	59.1
102	.0707	2.036	27.885	.0659	.002997	.068897	59.5
112	.0694	2.731	27.190	.0631	.003946	.067042	60.6
122	.0682	3.621	26.300	.0599	.005142	.065046	61.7
132	.0671	4.752	25.169	.0564	.006639	.063039	62.5
142	.0660	6.165	23.756	.0524	.008473	.060873	63.7
152	.0649	7.930	21.991	.0477	.010716	.058416	64.7
162	.0638	10.099	19.822	.0423	.013415	.055715	65.8
172	.0628	12.758	17.163	.0360	.016682	.052682	66.9
182	.0618	15.960	13.961	.0288	.020536	.049336	68.0
192	.0609	19.828	10.093	.0205	.025142	.045642	69.0
202	.0600	24.450	5.471	.0109	.030545	.041445	70.0
212	.0591	29.921	0.000	.0000	.036820	.036820	71.1

Proper Temperature of Rooms, Halls, etc.

Rooms in which the occupants are not actively engaged:

	Degrees
Living rooms, business rooms, court houses, offices, schools	68 to 70
Lecture halls and auditoriums	60 to 65
Rooms used only as sleeping rooms	60 to 65
Bath-rooms in dwellings	68 to 72
Sick rooms	72

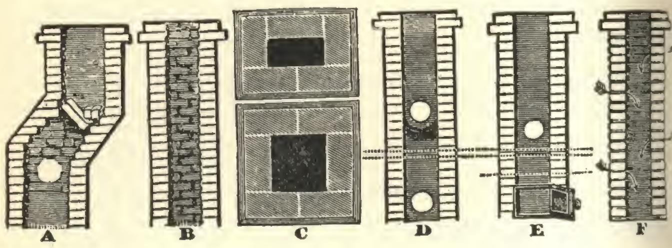
Rooms in which the occupants are actively engaged:

Workshops, gymnasiums, etc. where the exertion is vigorous	50 to 60
Workshops in which the exertion is not so vigorous	60 to 65

Rooms generally occupied by people in street dress:

Entrance halls, passages, corridors, and vestibules	55 to 60
Churches	50 to 60

Chimney Flues



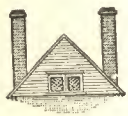
A. Many flues are poorly built and left filled with brick and mortar. They should be clean.

B. Flues should not be left rough on inside, but finished smooth and clean.

C. Flues should be as near square as possible. A round chimney makes the best flue.

D. Smoke flues cause trouble when there are several pipe openings. Only one should be used, and all other openings closed.

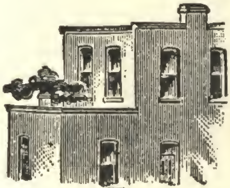
Poor Draft to Chimney



Good Draft to Chimney

Chimney Flues (Continued)

G



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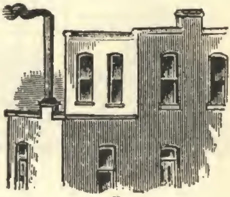


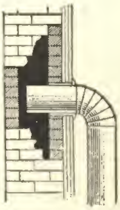
I

E. For best results, flues should be stopped off directly below smokepipe connection.

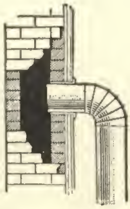
F. Cracks or openings into flue, allowing air leakage, kill draft. Flues should be tight.

G. Poor flue construction, should be finished on top like "I" or "K."

H. Flues should be carried up as high as any surrounding building. See "I."

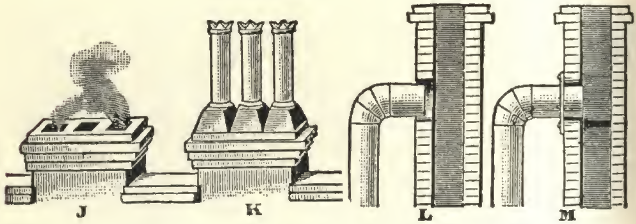


Poor Connection and No Draft



Proper Smokepipe Connection

Chimney Flues (Continued)

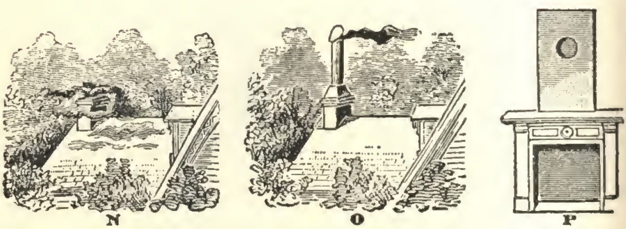


J. Some flues are too flat on top; they should be finished like "K."

L. Smokepipe connection should be cemented into flue or have tight collar like "M." Leakage of air into flue will kill draft.

N. When high trees surround flue, finish chimney like "O."

P. When there is opening from fireplace into flue, close fireplace air tight.



Chimney Flues (Continued)

Care must be taken in the selection of a proper flue for heating apparatus, and the following table by Prof. R. C. Carpenter is offered only as a guide to assist the engineer. Consideration must be taken of the character of the flue itself and the location of the top outlet in connection with surrounding buildings. The figures given are diameters in inches or the side of a square, and it is figured that 10 x 10 flue is only of equal working area to a 10-inch round.

Direct Radiation*		Height of Chimney Flue					
Steam in Sq. Feet	Water in Sq. Feet	20 ft.	30 ft.	40 ft.	50 ft.	60 ft.	80 ft.
250	375	7.4	7.	6.7	6.4	6.2	6.
500	750	9.6	9.2	8.8	8.2	8.	6.6
750	1150	11.3	10.8	10.2	9.6	9.3	8.8
1000	1500	12.8	12.	11.4	10.8	10.5	10.
1500	2250	15.2	14.4	13.4	12.8	12.4	11.5
2000	3000	17.2	16.3	15.2	14.5	14.	13.2
3000	4500	20.6	18.5	18.2	17.2	16.6	15.8
4000	6000	23.6	22.2	20.8	19.6	19.	17.8
5000	7500	26.	24.6	23.	21.6	21.	19.4
6000	9000	28.4	26.8	25.	23.4	22.8	21.2
7000	10500	30.4	28.8	27.	25.5	24.4	23.
8000	12000	32.4	30.6	28.6	26.8	26.	24.2
9000	13500	34.	32.4	30.4	28.4	27.4	25.6
10000	15000	37.	34.	32.	30.	28.6	27.0

* Note—When a considerable amount of Indirect radiation is to be used increased Boiler Capacity is necessary and in many cases such demands require a larger chimney flue for same number of square feet of radiation used.

Table of Expansion of Wrought Iron Pipe

Temperature of the Air when the Pipe is fitted	Increase in length, in inches, per 100 ft. when heated to									
Degrees Fahrenheit	160°	180°	200°	212°	228°	240°	250°	259°	267°	274°
0	1.28	1.44	1.60	1.69	1.82	1.92	2.00	2.07	2.13	2.20
32	1.02	1.18	1.34	1.43	1.56	1.66	1.74	1.81	1.87	1.94
64	.77	.93	1.09	1.18	1.31	1.41	1.49	1.56	1.61	1.69

Wrought iron pipe expands, in inches, per 100 feet, $\frac{4}{5}$ of the increase in temperature of steam or water it is subjected to over the temperature at the time of installation, divided by 100.

Examples—Temperature when installed 32°, 10 pounds pressure = 240°. Difference 208°, $\frac{4}{5}$ of which equals $1\frac{66}{100}$ inches expansion per 100 feet.

Special attention must be given to the expansion and contraction of pipes and allowance made for it. Pipes and branches must be unconfined, especially in the direction of their length.

Expansion joints should not be used if the expansion can be compensated for in any other way.

Capacities of Tanks in Gallons

Length or Depth in Feet	Diameter in Inches										
	18	24	30	36	42	48	54	60	66	72	78
2	26	47	73	105	144	188	238	294	356	424	497
2½	33	59	90	131	180	235	298	367	445	530	621
3	40	71	109	157	216	282	357	440	534	636	745
3½	47	83	127	183	252	329	416	513	623	742	869
4	54	95	145	209	288	376	475	586	712	848	993
4½	61	107	163	235	324	423	534	659	801	954	1,117
5	68	119	180	261	360	470	593	732	890	1,060	1,241
5½	75	131	200	287	396	517	652	805	979	1,166	1,365
6	82	143	217	313	432	564	711	878	1,068	1,272	1,489
6½	89	155	235	339	468	611	770	951	1,157	1,378	1,613
7	96	167	253	365	504	658	829	1,024	1,246	1,484	1,737
7½	103	179	271	391	540	705	888	1,097	1,335	1,590	1,861
8	110	191	289	417	576	752	947	1,170	1,424	1,696	1,985
8½	...	203	307	443	612	799	1,006	1,243	1,513	1,802	2,109
10	...	239	361	521	720	940	1,183	1,462	1,780	2,120	2,481
12	...	287	433	625	864	1,128	1,419	1,754	2,136	2,544	2,977
14	...	...	...	...	1,008	1,316	1,655	2,046	2,492	2,968	3,473
16	...	...	...	...	1,152	1,504	1,891	2,338	2,848	3,392	3,969
18	...	...	...	...	....	....	2,127	2,630	3,204	3,816	4,465
20	...	...	...	...	....	....	2,363	2,922	3,560	4,240	4,961

To find the contents in gallons of any cylinder; square the diameter, multiply by the length, and this product by .0034.

Velocity of Flow of Water

In Feet per Minute, Through Pipes of Various Sizes, for Varying Quantities of Flow

Gls. per Minute	¾ Inch	1 Inch	1¼ Inch	1½ Inch	2 Inch	2½ Inch	3 Inch	4 Inch
5	218	122½	78½	54½	30½	19½	13½	7⅔
10	436	245	157	109	61	38	27	15⅓
15	653	267½	235½	163½	91½	58½	40½	23
20	872	490	314	218	122	78	54	30⅔
25	1090	612½	392½	272½	152½	97½	67½	38⅓
30		735	451	327	183	117	81	46
35		857½	549½	381½	213½	136½	94½	53⅔
40		980	628	436	244	156	108	61⅓
45		1102½	706½	490½	274½	175½	121½	69
50			785	545	305	195	135	76⅔
75			1177½	817½	457½	292½	202½	115
100				1090	610	380	270	153⅓
125					762½	487½	337½	191⅔
150					915	585	405	230
175					1067½	682½	472½	268⅓
200					1220	780	540	306⅔

Area of Circles

Size	Area	Size	Area	Size	Area	Size	Area
1/8	0.0123	10	78.54	30	706.86	65	3318.3
1/4	0.0491	1/2	86.59	31	754.76	66	3421.2
3/8	0.1104	11	95.03	32	804.24	67	3525.6
1/2	0.1963	1/2	103.86	33	855.30	68	3631.6
5/8	0.3067	12	113.09	34	907.92	69	3739.2
3/4	0.4417	1/2	122.71	35	962.11	70	3848.4
7/8	0.6013	13	132.73	36	1017.8	71	3959.2
1	0.7854	1/2	143.13	37	1075.2	72	4071.5
1/8	0.9940	14	153.93	38	1134.1	73	4185.3
1/4	1.227	1/2	165.13	39	1194.5	74	4300.8
3/8	1.484	15	176.71	40	1256.6	75	4417.8
1/2	1.767	1/2	188.69	41	1320.2	76	4536.4
5/8	2.073	16	201.06	42	1385.4	77	4656.0
3/4	2.405	1/2	213.82	43	1452.2	78	4778.3
7/8	2.761	17	226.98	44	1520.5	79	4901.6
2	3.141	1/2	240.52	45	1590.4	80	5026.5
1/4	3.976	18	254.46	46	1661.9	81	5153.0
1/2	4.908	1/2	268.80	47	1734.9	82	5281.0
3/4	5.939	19	283.52	48	1809.5	83	5410.6
3	7.068	1/2	298.64	49	1885.7	84	5541.7
1/4	8.295	20	314.16	50	1963.5	85	5674.5
1/2	9.621	1/2	330.06	51	2042.8	86	5808.8
3/4	11.044	21	346.36	52	2123.7	87	5944.6
4	12.566	1/2	363.05	53	2206.1	88	6082.1
1/2	15.904	22	380.13	54	2290.2	89	6221.1
5	19.635	1/2	397.60	55	2375.8	90	6361.7
1/2	23.758	23	415.47	56	2463.0	91	6503.8
6	28.274	1/2	433.73	57	2551.7	92	6647.6
1/2	33.183	24	452.39	58	2642.0	93	6792.9
7	38.484	1/2	471.43	59	2733.9	94	6939.7
1/2	44.178	25	490.87	60	2827.4	95	7088.2
8	50.265	26	530.93	61	2922.4	96	7238.2
1/2	56.745	27	572.55	62	3019.0	97	7389.8
9	63.617	28	615.75	63	3117.2	98	7542.9
1/2	70.882	29	660.52	64	3216.9	99	7697.7

To find the circumference of a circle when diameter is given, multiply the given diameter by 3.1416. To find the diameter of a circle when circumference is given, multiply the given circumference by .31831.

Useful Information

To find circumference of a circle multiply diameter by 3.1416.

To find diameter of a circle multiply circumference by .31831.

To find area of a circle multiply square of diameter by .7854.

To find surface of a ball multiply square of diameter by 3.1416.

To find side of an equal square multiply diameter by .8862.

To find cubic inches in a ball multiply cube of diameter by .5236.

Doubling the diameter of a pipe increases its capacity four times.

A gallon of water (U. S. standard) weighs $8\frac{1}{3}$ pounds and contains 231 cubic inches.

A cubic foot of water contains $7\frac{1}{2}$ gallons, 1728 cubic inches, and weighs $62\frac{1}{2}$ pounds.

To find the pressure in pounds per square inch of a column of water multiply the height of the column in feet by .434.

Steam rising from water at its boiling point (212 degrees) has a pressure equal to the atmosphere (14.7 pounds to the square inch).

A standard horsepower: The evaporation of 30 pounds of water per hour from a feed water temperature of 100 degrees Fahr. into steam at 70 pounds gauge pressure. (Equivalent to $34\frac{1}{2}$ pounds from and at 212 degrees Fahr.)

To find capacity of tanks any size: given dimensions of a cylinder in inches, to find its capacity in U. S. gallons; square the diameter; multiply by the length and by .0034.

To ascertain heating surface in tubular boilers multiply two-thirds the circumference of boiler by length of boiler in inches and add to it the outside surface of all the tubes.

One-sixth of tensile strength of plate multiplied by thickness of plate and divided by one-half the diameter of boiler gives safe working pressure for tubular boilers with single riveted longitudinal seams. Add 20 per cent for double riveted seams.

Radius of a circle $\times$ 6.283185 = circumference.

Square of the diameter of a circle $\times$ 0.7854 = area.

Square of the circumference of a circle $\times$ 0.07958 = area.

Half the circumference of a circle $\times$ half its diameter = area.

Circumference of a circle $\times$ 0.159155 = radius.

Square root of the area of a circle $\div$ 0.56419 = radius.

Square root of the area of a circle $\times$ 1.12838 = diameter.

One pound of gold bronze is suitable for 150 to 200 feet of radiation. One pound of aluminum bronze is suitable for 350 to 400 feet of radiation. One gallon liquid is equal to 4 pounds of bronze powder.

Metric and English Measures

Measures of Length

	Metric			English
1	metre................	=	39.37	inches
			2.38	feet
.3048	metre................	=	1	foot
1	centimetre...........	=	.3937	inch
2.54	centimetres..........	=	1	inch
1	millimetre...........	=	.03937	inch
25.4	millimetres..........	=	1	inch
1	kilometre............	=	1093.61	yards

Measures of Surface

1	square metre.........	=	10.764	square feet
.0929	square metre.........	=	1	square foot
1	square centimetre.....	=	.155	square inch
6.452	square centimetres.....	=	1	square inch
1	square millimetre	=	.00155	square inch
645.2	square millimetres.....	=	1	square inch

Measures of Volume

1	cubic metre..........	=	35.314	cubic feet
.02832	cubic metre..........	=	1	cubic foot
1	cubic decimetre.......	=	61.023	cubic inches
			.0353	cubic foot
28.32	cubic decimetres.......	=	1	cubic foot
16.387	cubic centimetres......	=	1	cubic inch
1	cubic centimetre.......	=	1	millimetre
			.061	cubic inch

Measures of Capacity

1	litre = 1 cubic decimetre	=	61.023	cubic inches
			.0353	cubic foot
			.2202	gallon (Imperial)
			2.202	pounds of water at 62 degrees Fahr.
28.317	litres................	=	1	cubic foot (6.25 Imperial gallons)
4.543	litres................	=	1	gallon (Imperial)
3.785	litres................	=	1	gallon (American)

Measures of Weight

28.35	grammes.............	=	1	ounce avoirdupois
1	kilogramme..........	=	2.2046	pounds
.4536	kilogramme..........	=	1	pound
1 / 1000	metric ton / kilogrammes	=	.9842	ton of 2240 lbs. or
			19.68	cwts. or 2204.6 lbs.
1.016 / 1016	metric tons / kilogrammes	=		1 ton of 2240 pounds

Miscellaneous

1	gramme per square millimetre............	=	1.422	lbs. per square inch
1	kilogramme per square millimetre..........	=	1422.32	lbs. per square inch
1	kilogramme per square centimetre..........	=	14.223	lbs. per square inch
1.0335	kg. per sq. centimetre / 1 atmosphere.....	=	14.7	lbs. per square inch
0.070308	kilogramme per square centimetre..........	=	1	lb. per square inch

Climatic Temperatures

Lowest and Average Degrees in the U. S.

October 1st to May 1st. All Stated in Fahrenheit

(Compiled from U. S. Weather Bureau Records)

State	City	Lowest	*Av.
Ala.	Mobile	–1	57.7
	Montgomery	–5	56.1
Ariz.	Flagstaff	–21	34.8
	Phoenix	22	58.9
Ark.	Fort Smith	–15	49.5
	Little Rock	–12	52.0
Cal.	San Diego	32	57.2
	Independence	10	48.7
Col.	Denver	–29	38.4
	Grand Jct.	–16	39.2
Conn.	Southington	–19	36.3
D. C.	Washington	–15	42.9
Fla.	Jupiter	24	69.8
	Jacksonville	10	60.9
Ga.	Savannah	8	57.2
	Atlanta	–8	51.4
Idaho	Boise	–28	39.6
	Lewiston	–18	42.5
Ill.	Chicago	–23	35.9
	Springfield	–22	39.0
Ind.	Indianapolis	–25	40.4
	Evansville	–15	44.1
Iowa	Sioux City	–31	32.1
	Keokuk	–26	37.6
Kan.	Dodge City	–26	....
	Wichita	–22	42.9
Ky.	Louisville	–20	45.0
La.	New Orleans	7	60.5
	Shreveport	–5	55.7
Me.	Eastport	–21	31.1
	Portland	–17	33.5
Md.	Baltimore	–7	43.3
Mass.	Boston	–13	37.2
Mich.	Alpena	–27	29.1
	Detroit	–24	35.3
Minn.	Duluth	–41	25.5
	Minneapolis	–33	28.4
Miss.	Meridian	–6	53.9
	Vicksburg	–1	56.0
Mo.	Springfield	–29	43.0
	Hannibal	–20	39.7
Mont.	Havre	–55	27.7
	Helena	–42	30.9
Neb.	North Platte	–35	34.6
	Lincoln	–29	35.8
Nev.	Carson City	–22	....
	Winnemucca	–28	37.9
N. H.	Concord	–35	33.1
N. J.	Atlantic City	–7	41.6
N. Y.	Saranac Lake	–38	34.1
	New York City	–6	40.1
N. M.	Roswell	–14	48.9
	Santa Fe	–13	38.0
N. C.	Hatteras	8	53.3
	Charlotte	–5	49.8
N. D.	Devil's Lake	–51	18.9
	Bismarck	–44	23.5
Ohio	Toledo	–16	36.8
	Columbus	–20	39.8
Okla.	Oklahoma	–17	47.1
Ore.	Baker City	–20	34.1
	Portland	–2	45.4
Pa.	Pittsburgh	–20	40.8
	Philadelphia	–6	41.8
R. I.	Providence	–9	37.5
	Block Island	–4	39.7
S. C.	Charleston	7	56.9
	Columbia	2	53.5
S. D.	Huron	–43	25.9
	Yankton	–32	31.2
Tenn.	Knoxville	–16	47.0
	Memphis	–9	50.7
Tex.	Corpus Christi	11	62.7
	Fort Worth	–8	49.5
Utah	Salt Lake City	–20	39.7
Vt.	Northfield	–32	27.8
Va.	Cape Henry	5	48.6
	Lynchburg	–5	45.2
Wash.	Seattle	3	44.3
	Spokane	–30	37.0
W. Va.	Parkersburg	–27	41.9
	Elkins	–21	38.8
Wis.	La Crosse	–43	31.2
	Milwaukee	–25	32.4
Wyo.	Cheyenne	–38	33.7
	Lander	–36	29.0

Testing Installations

Completed installations may be tested at any time of year by means of the following table of outside and inside temperatures (Carpenter):

To Equal a Temperature of 70 Degrees Fahrenheit in Zero Weather

If outside temperature is	It is necessary to maintain an inside temperature of
10 below zero, Fahrenheit	64 above zero, Fahrenheit
zero, Fahrenheit	70 above zero, Fahrenheit
10 above zero, Fahrenheit	75 above zero, Fahrenheit
20 above zero, Fahrenheit	81 above zero, Fahrenheit
30 above zero, Fahrenheit	85 above zero, Fahrenheit
40 above zero, Fahrenheit	90 above zero, Fahrenheit
50 above zero, Fahrenheit	98 above zero, Fahrenheit
60 above zero, Fahrenheit	104 above zero, Fahrenheit
70 above zero, Fahrenheit	110 above zero, Fahrenheit
80 above zero, Fahrenheit	117 above zero, Fahrenheit
90 above zero, Fahrenheit	123 above zero, Fahrenheit

Centigrade to Fahrenheit

If above freezing point, multiply number of degrees by 9, divide product by 5, and add 32 to quotient.

If below freezing point, multiply number of degrees by 9, divide product by 5, and take difference between 32 and quotient.

Fahrenheit to Centigrade

If above zero, multiply difference between number of degrees and 32 by 5, and divide product by 9.

If below zero, add 32 to number of degrees, multiply sum by 5, and divide product by 9.

Directions for Remedying Unsteady Water Lines in Steam Boilers

It is a well-known fact that most water-line trouble is due to the foaming action of the water caused by impurities, such as oil, grease and sediment, making necessary a thorough blowing off or washing out of the boiler. There are several ways that this can be done.

Blowing Off Under Pressure

Mix one pound of Babbitt's Lye with a half gallon of water. Take off the safety valve and pour the mixture into the boiler. For large sectional boilers, use two or three pounds of lye, mixing in the same way. Replace safety valve and get up steam in the boiler. Steam pressure should be carried for at least two hours. The coal fire should then be dumped and entirely removed from the boiler. A wood fire should be started and all radiator valves closed. When pressure is raised to a point where the safety valve starts to blow off, open the draw-off cock and allow all of the water to be blown out of the boiler, under pressure. Immediately draw the fire and open all doors and drafts and allow the boiler to cool down. When the boiler is sufficiently cool, fill with cold water up to the safety valve and then again open the draw-off cock and allow this to run off. Then refill boiler to the water line and start the fire. For best results, the draw-off cock should be at least 1 inch.

Washing Out Sectional Boilers

Remove safety valve and connect a nipple and tee under same, replacing safety valve on the top of the tee. Run a 1-inch pipe from side of tee to the nearest plumbing fixture or window. Turn on cold water supply full and let the water flow out through the pipe until it comes cold and clear. The cold water supply can then be shut off and the water drawn down to the regular water line, through the draw-off connections. This can be done without disturbing the fire in the boiler.

Washing Out Round Boilers

The simplest way to do this, on round boilers where the water column is connected only to the dome section, is by removing the lower tri-cock on water column and turning on the cold water supply. The water can be carried in pails to the nearest plumbing fixture, or a pipe connection can be taken from this opening to convenient point. Follow the same general directions as for washing out a sectional boiler.

Washing Out Round or Sectional Boilers When There is a Valve and Check Valve on Main Return

Close off the return valve and take top off the check. Turn on the cold water supply and let it run until all of the hot water in the boiler has gone up through the mains and out through the open check valve. This is the most effective washing-out process—as it thoroughly cleans out the mains and returns, as well as the boiler. When the water runs clear and cold through the check valve, close off the cold water supply and open the return valve, allowing the water to be drawn down to the proper water line. Then shut off the return valve and replace top of check, being sure that the return valve is again opened.

Special Notice

In many cases it is necessary to blow off or wash out boilers several times before all foreign matter is removed. All oil and grease and other foreign matter throughout the entire heating system gradually returns to the boiler. Obstinate cases have been found which require the washing-out process to be carried out five or six times before a thoroughly clean system and a steady water line were obtained.

THESE RULES APPLY TO ANY BOILER

To Clean a Water Gauge Glass on a Steam Boiler

Put in a cup of hot water a tablespoonful of raw acid, then close the top and bottom water gauges, open top water gauge and blow water out of glass through pet cock at bottom; again close top valve and place cup of hot water so bottom pet cock is submerged in the solution; a vacuum being caused, the acid and water will fill the gauge glass. By keeping the pet cock in the water and alternately opening and closing the top water gauge, the glass will be thoroughly cleansed; then close pet cock and open both water gauge cocks. The water line of the boiler will again show. It is necessary to have a pressure of one or two pounds on the boiler before proceeding as above.

Round Steam and Water Boilers Nos. 190 to 283

No.	Code Word	No.	Code Word
190 Steam	Multiply	190 Water	Myriad
191 Steam	Mumble	191 Water	Myriapod
192 Steam	Mummy	192 Water	Myrrh
221 Steam	Mundane	221 Water	Myrtle
222 Steam	Munition	222 Water	Myself
223 Steam	Murky	223 Water	Mystery
251 Steam	Murmur	251 Water	Myth
252 Steam	Museum	252 Water	Mystify
253 Steam	Musket	253 Water	Mystic
281 Steam	Muslin	281 Water	Mythical
282 Steam	Mustang	282 Water	Myriagram
283 Steam	Muzzle	283 Water	Mysticison

Round Steam and Water Boilers Nos. 417 to 1629

No.	Code Word	No.	Code Word
417 Steam	Fable	417 Water	Friar
517 Steam	Fabric	517 Water	Fang
420 Steam	Face	420 Water	Faro
520 Steam	Folly	520 Water	Fatal
423 Steam	Fad	423 Water	Fathom
523 Steam	Fanfare	523 Water	Fault
426 Steam	Freedom	426 Water	Favor
526 Steam	Frost	526 Water	Federal
1429 Steam	Force	1429 Water	Favorite
1529 Steam	Finish	1529 Water	Friend
1629 Steam	Fast	1629 Water	Forward

Sectional Steam and Water Boilers

No.	Code Word	No.	Code Word
214 Steam	Mud	214 Water	Muddle
215 Steam	Mulct	215 Water	Mulcted
216 Steam	Mug	216 Water	Muggy
217 Steam	More	217 Water	Moria
255 Steam	Moccasin	255 Water	Molar
256 Steam	Mocha	256 Water	Molest
257 Steam	Mode	257 Water	Mollusk
258 Steam	Modern	258 Water	Moment
355 Steam	Moline	355 Water	Muse
356 Steam	Mosaic	356 Water	Musty
357 Steam	Money	357 Water	Mute
358 Steam	Moose	358 Water	Mucilage
359 Steam	Moras	359 Water	Muff
427 Steam	Molly	427 Water	Mullet
428 Steam	Modus	428 Water	Mum
429 Steam	Molasses	429 Water	Munch
4210 Steam	Morris	4210 Water	Mural
4211 Steam	Monteley	4211 Water	Muscle
536 Steam	Mock	536 Water	Mocked
537 Steam	Mold	537 Water	Molded
538 Steam	Move	538 Water	Moved
539 Steam	Mount	539 Water	Mounted
5310 Steam	Mottle	5310 Water	Mottled

Hot Water: Tank and Laundry Heaters

No.	Code Word	No.	Code Word
110-T	Kedge	1-B Union	Kersey
112-T	Keel	4 Union	Kirk
114-T	Keen	115	Kale
170	Knave	123-T	Kipe
200	Knight	123-B	Kope
230	King	124-T	Kipper

Western Series
Tank Heaters

No.	Code Word
1-A Union	Kenzie
601	Kenoe
411	Kettie

Smokeless Boilers

No.	Code Word	No.	Code Word
C-2075 Steam	Lea	C-2075 Water	Leach
C-2085 Steam	Lead	C-2085 Water	Leaden
C-2095 Steam	Leader	C-2095 Water	Leafage
C-2105 Steam	Learn	C-2105 Water	Lease
C-3075 Steam	Ledge	C-3075 Water	Leek
C-3085 Steam	Leeward	C-3085 Water	Leeway
C-3095 Steam	Legal	C-3095 Water	Legend
C-3105 Steam	Leghorn	C-3105 Water	Legible
C- 742 Steam	Label	C- 742 Water	Lactate
C- 842 Steam	Labile	C- 842 Water	Lacteal
C- 942 Steam	Labiose	C- 942 Water	Lactic
C-1042 Steam	Labor	C-1042 Water	Lactide
C-1142 Steam	Labra	C-1142 Water	Lactose
C-1242 Steam	Labret	C-1242 Water	Lacuna
C-1342 Steam	Lac	C-1342 Water	Lackwork
C-1442 Steam	Laccate	C-1442 Water	Lade
C-1542 Steam	Laccine	C-1542 Water	Ladder
C-1642 Steam	Laceat	C-1642 Water	Lading
C-1742 Steam	Lacing	C-1742 Water	Ladle
C-1842 Steam	Lack	C-1842 Water	Lady
C-1942 Steam	Lacker	C-1942 Water	Lag
C-2042 Steam	Lactage	C-2042 Water	Lagoon

Western Round Boilers

No.	Code Word	No.	Code Word
173 Steam	Dial	174 Water	Whip
174 Steam	Diameter	175 Water	Whirl
175 Steam	Diamond	176 Water	Whim
176 Steam	Diary	204 Water	Weave
203 Steam	Drastic	205 Water	Weed
204 Steam	Drama	206 Water	Weld
205 Steam	Draft	234 Water	Wide
206 Steam	Drape	235 Water	Wipe
233 Steam	Dent	236 Water	Win
234 Steam	Delve	264 Water	Wonder
235 Steam	Deep	265 Water	Wove
236 Steam	Deceive	266 Water	Word
263 Steam	Dove	294 Water	Wrap
264 Steam	Doubt	295 Water	Wrath
265 Steam	Dot	296 Water	Wren
266 Steam	Dower		
293 Steam	Dune		
294 Steam	Dupe		
295 Steam	Dusk		
296 Steam	Duty		

RICHARDSON

VAPOR-VACUUM-PRESSURE SYSTEM

Richardson & Boynton Co.

Manufacturers of

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The Richardson Vapor-Vacuum-Pressure System

A few general rules for estimating and installing

The *Richardson System* is a combination of vapor, vacuum and pressure heating. It combines all of the advantages of Low Pressure Steam and Hot Water Heating. It has the quick-acting, positive-heating effect of a steam plant, with the mild low temperature of hot water and in addition the advantage of complete control over the amount of heat entering each radiator.

The *Richardson System* operates most of the time without indicating pressure and part of the time under a partial vacuum. The advantages of the System are easily appreciated—vapor rises from heated water at a much lower temperature than that at which steam pressure is generated. Vapor or steam cannot circulate through any system until the air is removed. In an ordinary steam plant, with air valves, it is necessary to overcome the atmospheric pressure of 14.7 pounds in order to force the air out and to maintain a pressure in excess of the atmosphere to prevent it re-entering.

The *Richardson System* does away entirely with the use of air valves. The air and condensation are carried back through the return connection at the bottom of the radiator, the water being returned to the boiler and the air passing off through the *Rich-*

ardson Air Expeller and Vacuum Valve. This allows the air to pass freely from the *System*, but closes by expansion when vapor or steam reaches it, thereby preventing waste heat, and it remains closed so long as there is a vacuum in the *System* preventing the air from re-entering.

Under these conditions, vapor will circulate freely to all parts of the *System* with a pressure of only a few ounces.

Rule for Figuring Radiation for the Richardson System

We recommend, in connection with the *Richardson System*, the use of exactly the same amount of radiation as would be required for a Gravity Steam Job, using hot water pattern radiators.

In figuring radiation required for any given room it is necessary, if accurate results are desired, to take into consideration the glass and wall exposures as well as the cubical contents and we recommend the following rule, which is easily understood and simple to work out, and it is one which has given general satisfaction through many years of actual experience:

Rule

First, find the total square feet of glass surface in windows and outside doors, taking the full opening. Then measure the surface in exposed outside walls, from which subtract the glass surface. The wall surface must then be reduced to equivalent glass surface by dividing the net amount of wall surface by

10 if wall is 8 to 10 in. thick.
15 if wall is 12 to 26 in. thick.
20 if wall is 28 to 38 in. thick.

To this result add the actual glass surface, which gives the glass equivalent of wall and glass exposures. Multiply this total by 75, as one square foot of glass surface cools 75 cubic feet of air per hour. The result will give the total cubic feet of air to be heated to offset the loss from glass and wall exposures. To this total must be added the cubical contents of the room to be heated and the grand total multiplied by .0055 for a temperature of 70 degrees Fahr. in zero weather. The result will be the square feet of radiation required. For each degree below zero, for which the heating is required, add 1 per cent to the radiation.

It is necessary in using this or any rule to use good judgment in increasing the amount of radiation on the first floor and also in the rooms on the cold side, exposed to the north and west, and reducing the radiation on the warm side. Also, making allowance for poorly constructed buildings and loose fitting windows, etc. Best results will be obtained by adding 10 per cent to the radiation for the first floor. If rooms have open fireplaces it is advisable to figure on at least two changes of air per hour, which would require adding the cubical contents twice, as this rule allows for only one change of air per hour. For indirect radiation, increase the amount of heating surface 60 per cent.

Directions for Ordering Radiation

All radiators to be tapped as follows:

Up to	50 sq. ft., inclusive,	½ in. x ½ in.
Above	50 up to 110 sq. ft.,	¾ in. x ½ in.
Above	110 sq. ft. . . .	1 in. x ½ in.

All tappings to be top and bottom, same end, excepting any radiators exceeding in length two and one half times the height, in which case the tappings shall be top and bottom opposite ends. *Bottom tappings must be center tapped bushings, not eccentric and not solid.* All radiators to be hot water pattern. All radiators to be thoroughly washed; supply and return openings plugged with wooden plugs and air vent tappings with iron plugs.

All radiators must be thoroughly cleaned of core sand and other foreign matter.

Piping System

Use the full number of supply tappings on boiler, running full size of tappings to highest point. Then, if necessary, use reducing elbow at this point. Mains to be run to suit the local conditions.

It is not always advisable to use a single circuit system, especially if mains are long, but rather to run two or more circuits, as the radiators will heat more quickly.

The piping plans shown on the following pages are intended to give a general idea as to the arrangement of the supply and return mains, showing one circuit for a small building and two circuits for a larger one. Many times it is necessary, on large jobs, to use three or four separate mains. A separate air return line main must be run in connection with each separate supply main, with an air expeller and vacuum valve for each separate air return line main. *Do not connect two air return line mains to one expeller.*

The tables giving the sizes of mains, together with the various illustrations shown herein, will give a very clear idea as to the best means for meeting ordinary

conditions. Particular attention must be paid to the grade of mains and branches.

Air Return Line

Each air return line main must be started where the first radiator is taken off supply main and the air return line extended through, with the steam main running parallel to same, pitching down same as steam main and increasing in size to provide for the added connections. The tables and illustrations will give full information as to the size air return line necessary for different amounts of radiation.

Grade of Piping

It is absolutely necessary to the successful operation of the "*Richardson*" Vapor-Vacuum-Pressure System that all piping must have proper grade or pitch.

All lateral pipes or branches in cellars and all horizontal pipes under floors (both supply and return) should have a grade of at least 1 inch in 2 feet.

The supply mains and air return line mains should have a grade of 1 inch in 20 feet, and if pipes are straight and true it will be no advantage to have more grade; on the other hand, in low cellars it would be a decided disadvantage, for the reason that at least 24 inches is required between the water line of boiler and the low point of supply and air return line mains. A clearance of 30 inches is better than 24 inches, and on large installations or long mains the minimum clearance should be 30 inches, and 36 inches is even better.

Pipe Sizes

Pipe sizes suggested for the "*Richardson*" Vapor-Vacuum-Pressure System of Heating.

Supply mains not exceeding 100 lineal feet in length:

Sq. Ft. Radiation	Pipe Size	Sq. Ft. Radiation	Pipe Size
150	1½ in.	1000	3 in.
400	2	1400	3½
600	2½	2000	4

Air return line mains:

Sq. Ft. Radiation	Pipe Size	Sq. Ft. Radiation	Pipe Size
80	¾ in.	1500	1½ in.
200	1	4000	2
800	1¼		

Risers up to 30 lineal feet high:

Sq. Ft. Radiation	Supply Riser	Return Riser	Sq. Ft. Radiation	Supply Riser	Return Riser
20	¾ in.	¾ in.	100	1¼ in.	¾ in.
60	1	¾	180	1½	¾

Wet return mains:

Sq. Ft. Radiation	Pipe Size	Sq. Ft. Radiation	Pipe Size
400	1 in.	1800	1½ in.
1000	1¼	5000	2

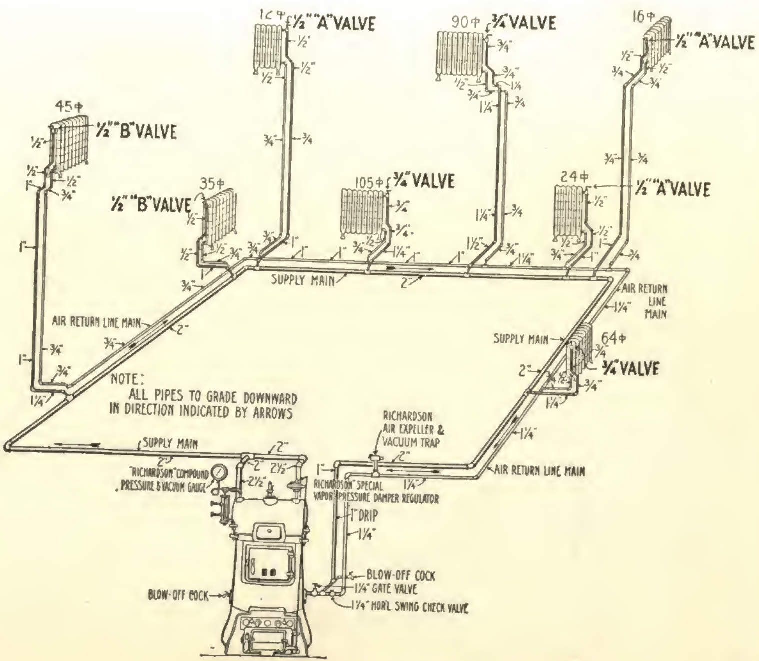
These tables are based on the supposition that no unusual conditions prevail and that the radiation is sufficient to maintain a temperature of 70 degrees Fahr. in zero weather.

If a temperature of less than 70 degrees is to be maintained, larger pipe sizes must be employed.

All lateral supply pipes connecting supply mains to vertical pipes and risers, also runouts or expansion pieces under floors which connect supply risers to radiators, should be at least one size larger than vertical pipes or risers, provided same are under 4 feet in length and at least two sizes larger when over 4 feet in length.

Special Note

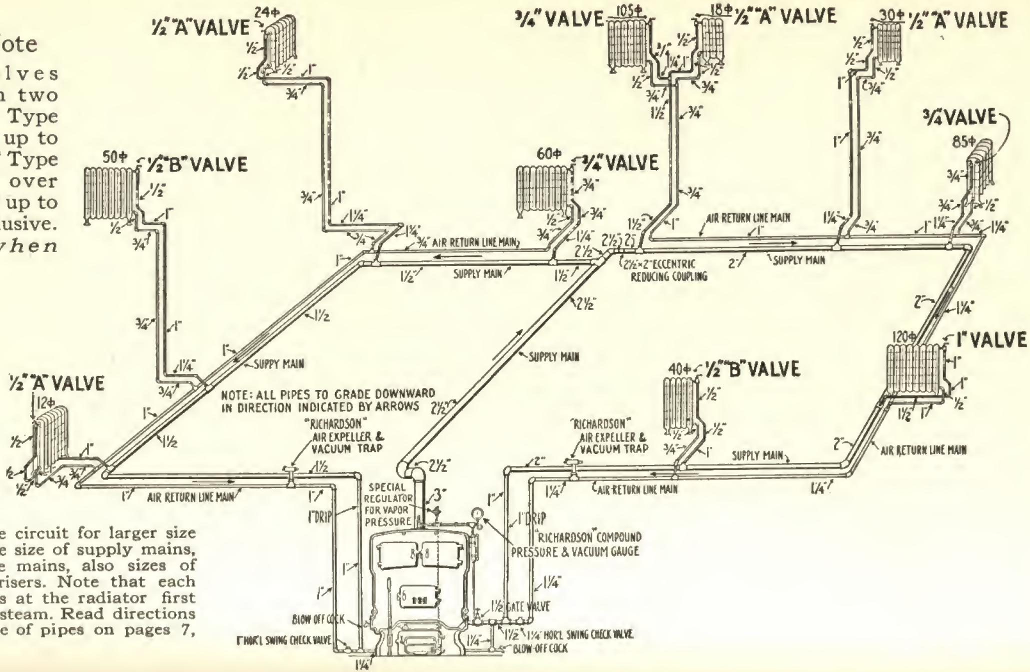
½-inch valves are made in two types. "A" Type for radiators up to 30 sq. ft. "B" Type for radiators over 30 sq. ft. and up to 50 sq. ft., inclusive. *Specify when ordering.*



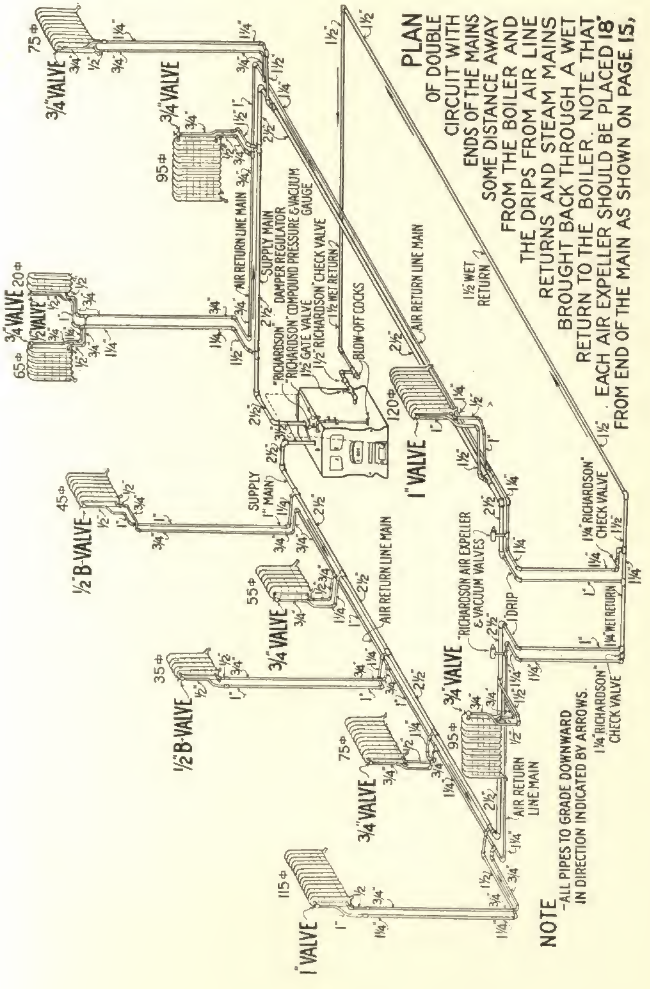
Plan of single circuit for moderate size job showing the size of supply main, air return line main, also sizes of branches and risers. Note that the air line begins at the radiator first supplied with steam. Read carefully directions regarding grade of pipes on pages 7, 13, 16 and 17.

Special Note

½-inch valves are made in two types. "A" Type for radiators up to 30 sq. ft. "B" Type for radiators over 30 sq. ft. and up to 50 sq. ft., inclusive. *Specify when ordering.*

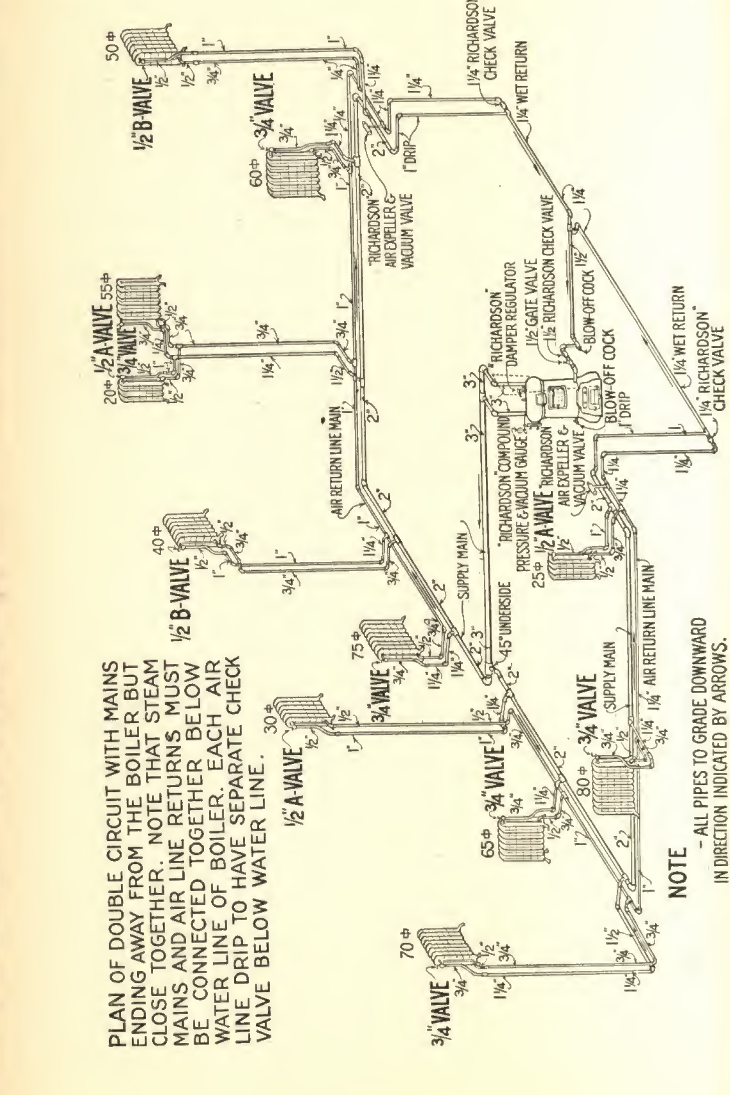


Plan of double circuit for larger size job showing the size of supply mains, air return line mains, also sizes of branches and risers. Note that each air line begins at the radiator first supplied with steam. Read directions regarding grade of pipes on pages 7, 13, 16 and 17.



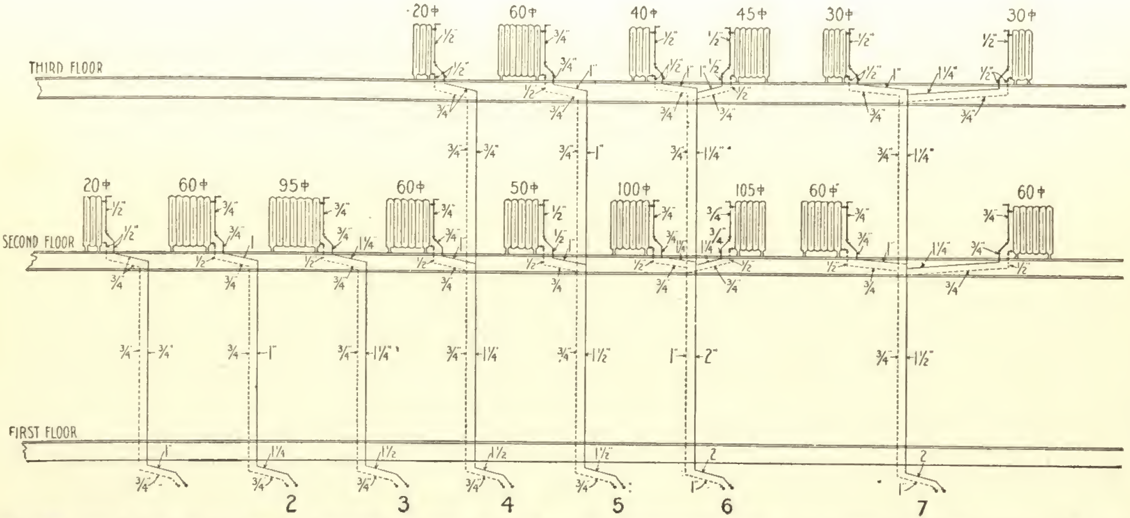
PLAN OF DOUBLE CIRCUIT WITH ENDS OF THE MAINS SOME DISTANCE AWAY FROM THE BOILER AND THE DRIPS FROM AIR LINE RETURNS AND STEAM MAINS BROUGHT BACK THROUGH A WET RETURN TO THE BOILER. NOTE THAT EACH AIR EXPELLER SHOULD BE PLACED 18" FROM END OF THE MAIN AS SHOWN ON PAGE 15.

NOTE—ALL PIPES TO GRADE DOWNWARD IN DIRECTION INDICATED BY ARROWS.



PLAN OF DOUBLE CIRCUIT WITH MAINS ENDING AWAY FROM THE BOILER BUT CLOSE TOGETHER. NOTE THAT STEAM MAINS AND AIR LINE RETURNS MUST BE CONNECTED TOGETHER BELOW WATER LINE OF BOILER. EACH AIR LINE DRIP TO HAVE SEPARATE CHECK VALVE BELOW WATER LINE.

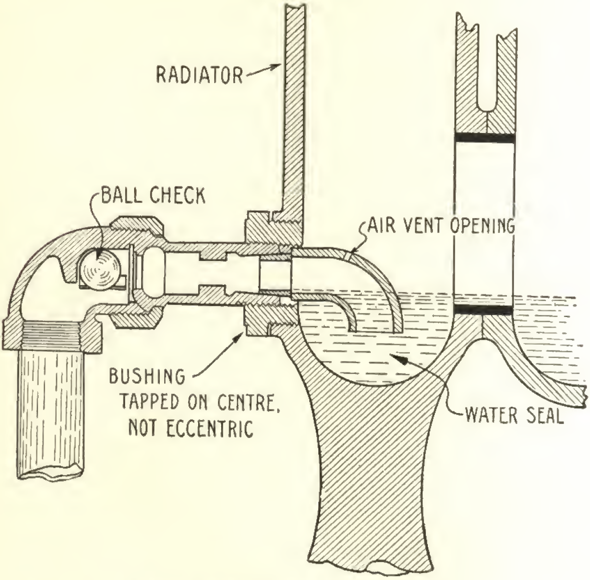
NOTE
– ALL PIPES TO GRADE DOWNWARD IN DIRECTION INDICATED BY ARROWS.



This riser plan is intended to show in a general way the amounts of radiation which can be carried on risers of various sizes, together with the sizes and arrangement of the air lines. Also showing where the sizes are to be reduced to meet the valve sizes and the sizes that the branches should be from the main to foot of risers.

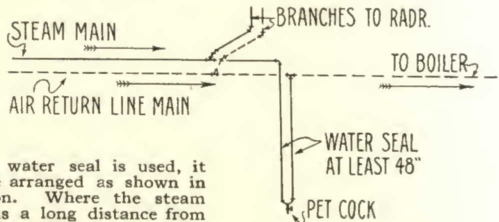
A careful study of the conditions in each case will make it possible to plan risers to meet all conditions. The risers are not reduced in size directly on the top, but are carried over full size under the floor and reduced where they turn up to connect to the radiator. No. 7 is intended to illustrate a condition where the radiators are not close to the risers but lateral branches of more than usual length are necessary. Note the supply lateral is a size larger than would be used when the run is only 2 or 3 ft.

Particular attention is called to the fact that all lateral branches should have a grade of at least 1 in. in 2 ft., in order to insure that there will be no traps under the floors.

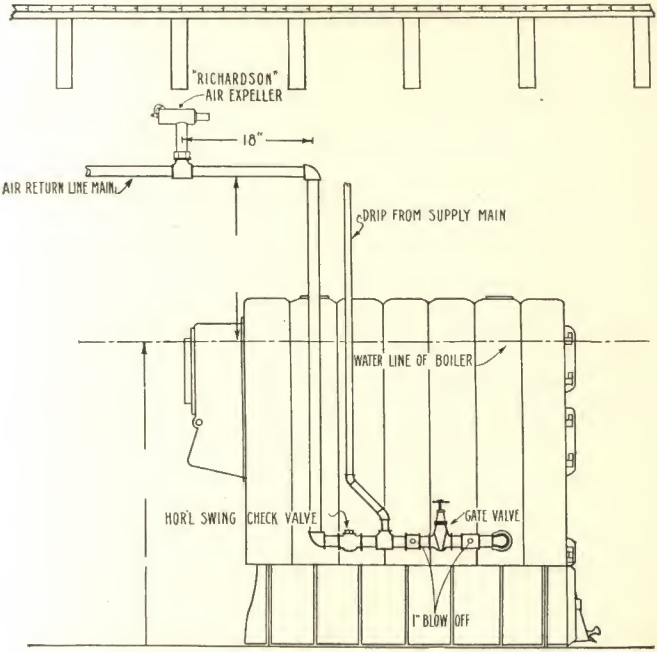


Section of Ball Check and Water Seal

The above illustration is intended to make clear the manner in which the water seal ball check union elbow is connected into radiator and to emphasize the necessity for the return connection in radiator to be a center tapped bushing. If the tapping is solid, the tail-piece strikes against the inside of the section. If the tapping is eccentric, it comes too close to the bottom of the section. Use care, therefore, in ordering the radiators to have bottom connections with center tapped bushings.

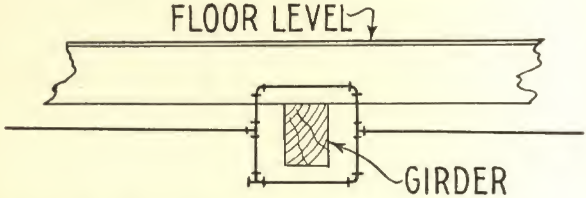


Where a water seal is used, it should be arranged as shown in illustration. Where the steam main ends a long distance from the boiler and it is not desirable to bring back a wet return, the drip from the steam main can be connected into the air return line in this manner.

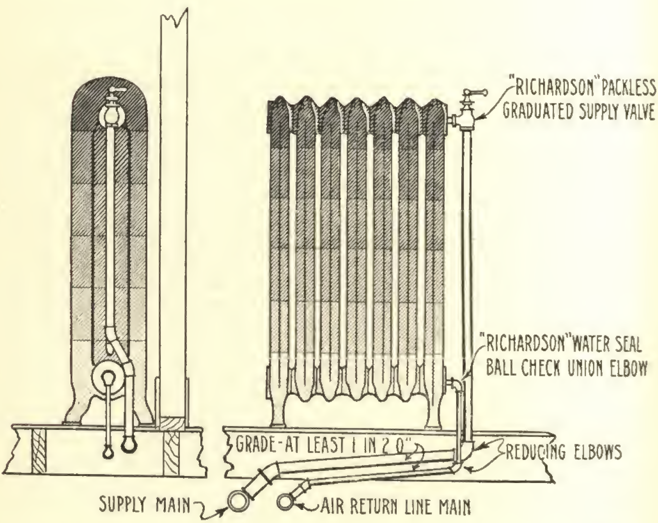


Return Connections at Boiler

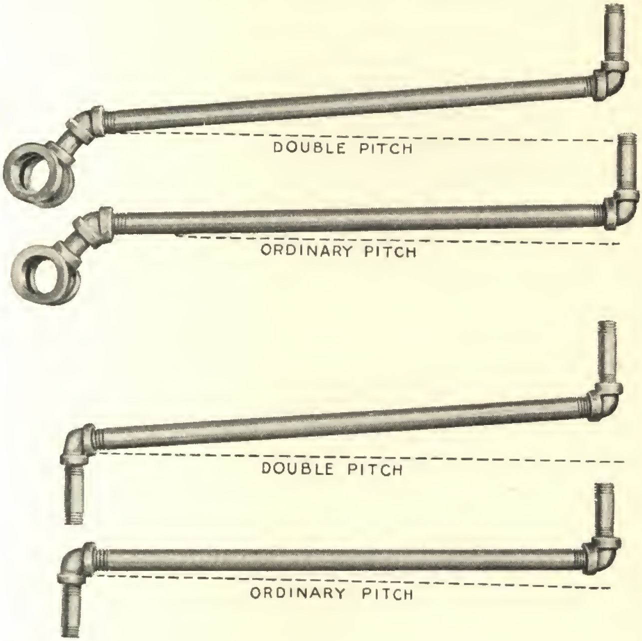
The above illustration shows clearly the proper method for connecting the air return line and the drip from supply main back into the boiler, with a connection to air expeller and the proper location of same. A horizontal swinging check valve should be placed on the air return line below the water line, before the drip from supply main is connected with a gate valve on the connection to the boiler.



Quite frequently it is difficult to get the proper distance between the low point of the main and the water line of the boiler, because of girders extending down below the floor beams. Where this condition is met, the proper grade of the mains can be secured by following the above illustration. This will give absolutely the same result as if the pipe had been carried straight through. The bottom of the loop will of course be filled with water and it is necessary to leave a tee as shown, with one outlet plugged so that the water can be drawn off if it is necessary at any time.

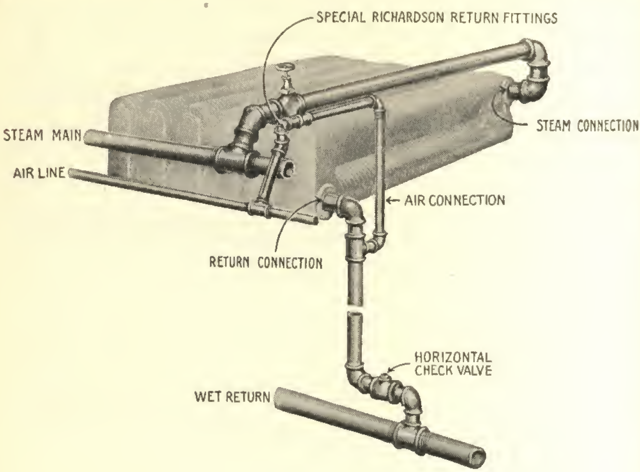


The above cut shows the most satisfactory method for connecting the supply and return connections to radiators. Care should be taken in carrying the branches from the mains, under the floor, to see that they have sufficient grade and are of proper size, reducing at elbow where they turn up through the floor.



This fully illustrates the grade which should be allowed on all branches. The upper pipes show a lateral branch from the main to the riser or first floor radiator connections. The grade should be double what is ordinarily allowed. The bottom pipes show laterals carried under the floor, from the top of riser to the radiator. Special care should be taken to see that these pipes have double the usual pitch.

Attention is also called to the riser plan showing sizes of these laterals under different conditions.



In many jobs it is necessary and advisable to use indirect radiation for heating the more important rooms. The above illustration shows clearly the way in which the indirect should be connected with either a gate valve on the steam main as shown, or if a globe valve is used it must be turned on its side.

From a tee in the return connection the air pipe is carried up over and into the main air return line, with a "*Richardson*" special return fitting, placed as indicated, with a horizontal check valve placed in the return line, below the water line, before it connects in the main wet return.

Important

One of the most important factors in the success of a Vapor-Vacuum-Pressure System is to have the entire system clean and free from oil, dirt or any foreign substance. Care should be taken to see that the radiators, piping and other parts of the apparatus are cleaned when they are put in position, and that in using red lead or other compounds that this is used on the pipe and not in the fitting. When the lead is put into the fitting and the pipe is screwed in, any surplus is pushed into the piping, while if the lead is put on the thread of the pipe, the surplus is pushed outside. A little care in these matters will prevent complaints.

Another very important consideration is in having the water in the boiler clean. To do this, the boiler should be blown off before the job is left. Usually a surface blow is all that is necessary, and where check valves and gate valves have been used on the returns, this can be done as follows:

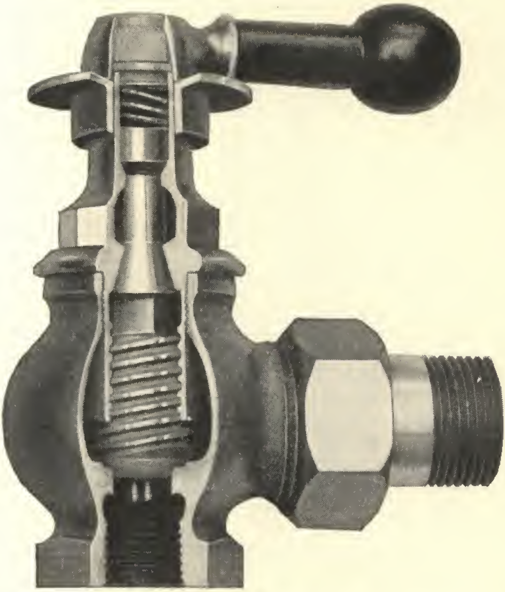
Close off the return valve and take the top off the check. Turn on the cold water supply and let it run until all the hot water in the boiler has gone up through the mains and out through the open check valve and the water is running clean and cold. This is a most effective washing out process, as it thoroughly cleans out the mains and the returns as well as the boiler. When the water runs clean and cold through the check valve, shut the cold water supply, and open the gate valve on the return, allowing the water to be brought down to the proper water level. Then shut off the return valve and replace the top on check, being sure that the return valve is again opened.

When it is necessary to blow the boiler off at the

bottom, through the draw-off cock, follow these directions:

Fill boiler with water to proper height of water line. Mix in a pail a quantity of lye with water. Remove safety valve from top of boiler and pour in the mixture, replacing the safety valve. With a wood fire get up a pressure of not less than 7 to 10 pounds. Open the draw-off cock at the bottom of boiler, keeping sufficient fire to maintain a pressure until all the water is blown out. Draw any remaining fire and open the clean out and feed doors and allow the boiler to cool down. After the boiler is sufficiently cool, turn on the cold water supply and allow the fresh water to run through the boiler and out of the draw-off cock for about five minutes. Then close the draw-off cock and fill boiler to the proper level.

Quite frequently it is necessary to give the system a surface blow to remove the lye which has been left in the boiler. In some cases it is necessary to blow off or wash out boilers several times before all foreign matter is removed. All oil, grease and other foreign matter throughout the entire heating system gradually works back to the boiler. Obstinate cases have been found which require the washing-out process to be carried out five or six times before a thoroughly clean system was secured.



The "Richardson"
Packless Graduated Supply Valve

The "*Richardson*" Packless Graduated Supply Valve is of heavy pattern, best steam metal, heavily nickel plated and furnished with hard rubber handle. A three-quarter turn opens or closes valve. It is also graduated for partial openings. Valves are made in four sizes:

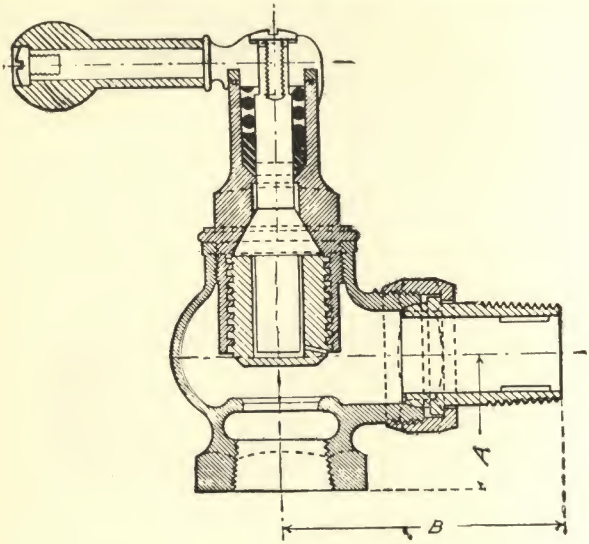
½-in. "A" type for radiators 30 ft. and under.

½-in. "B" type for radiators over 30 and up to 50 ft.

¾-in. for radiators over 50 and up to 110 ft.

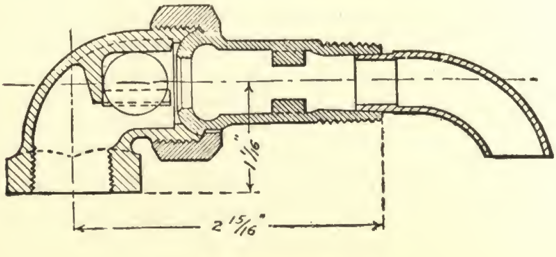
1-in. for radiators over 110 ft.

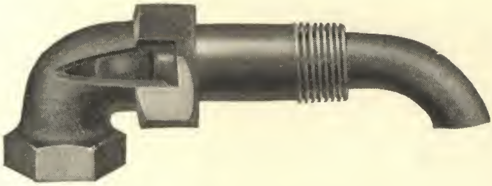
Valve is placed at top of radiator, same end as return connection excepting on radiators whose length is two and one-half times the height, in which case they are to be placed at the opposite end on top.



Measurements

Size	A	B
½ in.	1⅜ in.	2⅝ in.
¾	1 5/16	2¾
1	1½	2 11/16



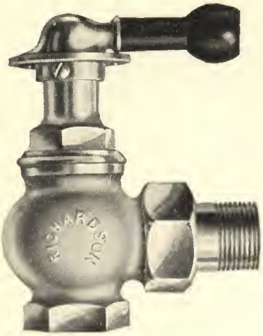


The "Richardson" Water Seal Ball Check Union Elbow

The "*Richardson*" Water Seal Ball Check Union Elbow is made in only one size—½-inch, which is ample for all radiators. It is placed at bottom of radiator and operates as follows: when supply valve is opened, the ball check opens and allows the condensation to pass freely into the return. If the supply valve is closed tight, the ball check closes to prevent water or vapor backing into the radiator. This return valve is entirely automatic. The air vent opening in the tailpiece of the elbow equalizes the pressure on both sides of water seal, preventing syphoning. It also allows the air in radiator to escape into return as soon as supply valve is opened.

The "Richardson" Air Expeller and Vacuum Valve

The "*Richardson*" Air Expeller and Vacuum Valve is placed at the end of each air return line in cellar. It automatically releases the air from the System but closes by expansion as soon as steam or vapor reaches it, preventing waste heat. The vacuum attachment prevents air from re-entering the System through the air expeller, when it cools off.



The "*Richardson*" Packless Graduated Supply Valve

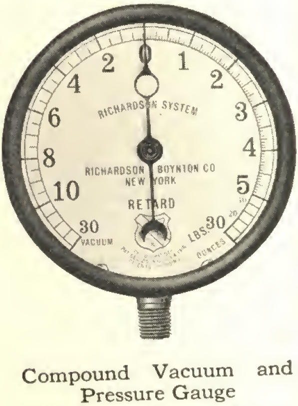
Is made of the best steam metal, heavily nickel plated and furnished with hard rubber handle

Top of "*Richardson*" Packless Graduated Supply Valve

Showing rubber handle and graduation for partial opening

"*Richardson*" Horizontal Swing Check Valves

Are made of heavy pattern brass and are designed especially for use with the "*Richardson*" Vapor - Vacuum - Pressure System and for all heating installations where quick-acting, dependable check valves are required



Compound Vacuum and Pressure Gauge

Figures to the left of zero indicate inches of vacuum; to the right, pressure of steam with graduation in ounces

List Prices

1—½-inch "A" type "*Richardson*" Packless Graduated Supply Valve	$5.00
1—½-inch "B" type "*Richardson*" Packless Graduated Supply Valve	5.00
1—¾-inch "*Richardson*" Packless Graduated Supply Valve	6.00
1—1-inch "*Richardson*" Packless Graduated Supply Valve	7.50
1—½-inch "*Richardson*" Water Seal Ball Check Union Elbow	4.00
1—"*Richardson*" Air Expeller and Vacuum Valve	15.00
1—"*Richardson*" Compound Pressure and Vacuum Gauge	8.50
1—¾-inch "*Richardson*" Horizontal Check Valve	2.00
1—1-inch "*Richardson*" Horizontal Check Valve	2.50
1—1¼-inch "*Richardson*" Horizontal Check Valve	3.00
1—1½-inch "*Richardson*" Horizontal Check Valve	4.00
1—2-inch "*Richardson*" Horizontal Check Valve	5.50